HIRUS

HIgh Resolution Urban Specific

DATA REQUIREMENTS SURVEY

FINDINGS

SEPTEMBER 1992

PREPARED FOR:

U. S. Army Topographic Engineering Center

Digital Concepts and Analysis Center

Fort Belvoir, Virginia 22060

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14. ABSTRACT

This Survey was conducted to determine the need for high resolution urban specific data to support US Army activities. It was sent to 41 selected organizations who had expressed prior interest in this type of information. Fifty-two usable responses were evaluated. These responses collectively establish a need for highly detailed information, at a nominal scale of 1:5,000, to support a wide number of users and applications across the operations, intelligence, modeling and simulation, research and development and training environments. The primary application areas that need these data are simulation/modeling and mission planning/rehearsal according to the responses received. Most indicate an interest in multi-scale data with the focus on 1:5,000 or larger scales. Nearly one-half of the responses said high resolution data was 1.5 meters or less. They wanted a data set capable of supporting advanced terrain visualization, line-of-sight analyses and detailed information on cultural and natural features for many divers tasks and applications. They expressed sophistication in their desires for data set content and manipulation techniques. The potential users want the capability to integrate this data with other types of data to provide an interlinked multi-media capability.

15. SUBJECT TERMS
Digital Data Sets; High Resolution Urban Specific Data Sets (HIRUS); Mapping; Tactical Terrain Data (TTD); Topography; Urban Terrain;

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PREFACE

Science Applications International Corporation, McLean, Virginia prepared this report for the U. S. Army Topographic Engineering Center (TEC), Digital Concents and Analysis Center, under Contract No. DACA 76-90-D-0002.

The project is part of Delivery Order No. 6 which included assisting with the questionnaire preparation, administering the questionnaire, tabulating the responses, and preparing a report concerning the findings. The task leader is Thomas E. Lee. This is SAIC Technical Report No. SAIC-92/1181.

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EXECUTIVE SUMMARY

This survey was conducted to determine the need for high resolution, urban specific data to support U. S. Army activities. It was sent to 41 selected organizations who had expressed prior interest in this type of information. Fifty-two usable responses were evaluated. These responses collectively establish a need for highly detailed information, at a nominal scale of 1:5,000, to support a wide number of users and applications across the operations, intelligence, modeling and simulation, research and development, and training environments. The primary applications areas that need these data are simulation/modeling and mission planning/rehearsal according to the responses received. Most indicated an interest in multi-scale data with the focus on 1:50,000 and larger scales. Nearly one-half of the responses said high resolution data was 1.5 meters or less. They wanted a data set capable of supporting advanced terrain visualization, line-of-sight analyses and detailed information on cultural and natural features for many diverse tasks and applications. They expressed sophistication in their desires for data set content and manipulation techniques. The potential users want the capability to integrate this data set with other types of data to provide an interlinked multi-media capability.

Based upon the interest expressed in this survey, the project should be broadened to address the wider Department of Defense needs. Once the full spectrum of requirements is ascertained, an architecture should be formulated, prototypes developed and tested and a draft Military Specification written.

PART I.

INTRODUCTION

In the 1984 report on the U.S. Army requirements for Digital Topographic Data (DTD), the U.S. Army, through its US Army Engineer Topographic Laboratory (USAETL), established a Service requirement for highly detailed, large-scale urban-oriented information. That report recommended the development of terrain data at two scales, level one at 1:50,000 and level two at 1:12,500. The level one product developed into the Defense Mapping Agency (DMA) standard product Tactical Terrain Data (TTD). Development of the level two product has been held in abeyance due to resource constraints associated with Interim Terrain Data (ITD) and the future production of TTD.

There continues to be a belief at the Digital Concepts and Analysis Center (DCAC) of the U.S. Army Topographic Engineering Center (USATEC) or TEC, the new designation for USAETL, that a high definition digital data base is required to support potential combat activity in urban areas. Several Army program managers have stated they will require this type of detailed information to make their systems fully operational. DMA has recognized this effort as part of its product standardization effort but there is no agreement as to the ability of DMA to produce the required data.

In 1990 DCAC briefed a high resolution data set concept to the High Resolution Simulation Conference held at Lawrence Livermore National Laboratory. A draft prototype specification for the project, named High Resolution Urban Specific Data Sets (HIRUS) was prepared in 1990 using a nominal scale of 1:5,000. In May, 1991 the subject was again briefed at the JANUS (T)(A) Users Conference and publicized in the USATEC "Digital Data Digest".

In 1991, as part of the US Army Contract, Army Systems/Topographic Data Requirements Research and Analysis, DACA76-90-D-0002, a task for Digital Topographic Data (DTD) Requirements Analysis Support was given to Science Applications International Corporation (SAIC). One aspect of that Delivery Order was to assist DCAC in the development, administration and data collation of a questionnaire concerning the need for high resolution data. The questionnaire was mailed to 41 addressees in February 1992.

RESPONDENT POPULATION

The HIRUS questionnaire was sent to 41 addressees who had previously expressed an interest to TEC in the development of a high resolution data set. The majority of these addressees were U.S. Army organizations or organizations that had a significant U.S. Army association, eg. U.S. Special Forces Command (USSOCOM). The mailing consisted of the following organizational mix.

2 Unified and Specified Command Headquarters
1 Joint Warfare Center
3 Unified and Specified Command Army Component Commands
7 U.S. Army Training Schools/Centers/Facilities
1 U.S. Army Operational Command
3 U.S. Army Operational Units
4 U.S. Army Engineer Laboratories/Centers/Station
1 U.S. Army Laboratory
2 U.S. Army RD&E Centers
10 U.S. Army Program Manager Offices
2 U.S. Army Command Directorates
2 U.S. Army Commands
3 Civilian Laboratories

RESPONSES

As a result of the 41 mailed questionnaires, 54 responses were received of which 52 provided usable information. Five responses were as a result of forwarding the questionnaire to non-addressee subordinate organizations (eg., USSOCOM) or lateral forwarding in the case of U.S. Southern Command (USSOUTHCOM) to U.S. Central Command (USCENTCOM). This broadened the response base somewhat by introducing one additional Joint respondent (USCENTCOM) and two non-Army respondents: Air Force Special Operations Command (AFSOC) and Commander, Naval Special Warfare (COMNAVSPECWAR). In addition, one Research Development and Engineering (RD&E) Center forwarded the questionnaire to one of its civilian contractors. Multiple responses were obtained from several addressees, particularly in the training community.

In viewing the findings of an interest or requirements survey such as this, it is important to consider the spectrum of respondents to the questionnaire so as to balance the responses and better evaluate the composite need. There are several ways to characterize groupings such as organizationally, functionally or by mission area. None of these methods was totally satisfactory for the purpose of this report, thus a hybrid method was applied to better illustrate the diversity of the respondent population. Using these scheme, the 52 complete questionnaire respondents were generally characterized as follows:

13	Special Operations (2)
8	Engineer (2)
7	Security and Intelligence (7)
8	Project Management Offices
4	RD&E Centers and Activities
4	Laboratories
3	U&S Command/Components (1)
5	U.S. Army Commands/Subordinates (1)

The numbers in parentheses behind the heading indicates the number of these respondents that were associated with training.

The detailed list of respondent organizations to the questionnaire is in Appendix 1.

PART II.

INTRODUCTION

Part II is the main body of the report; it will be formatted in the following manner. There are three main sections to the findings corresponding to the three substantive sections of the questionnaire. Section One addresses the need for DTD and high resolution data using 18 question statements/responses. Section Two addresses the content of a high resolution data set using 18 question statements/responses. Section three focuses on the manipulation of high resolution data, including how it would be used, displayed and integrated with other information. This takes 31 question statements/responses.

There are four sections for each question. Section one contains the question statement as it appeared in the survey, with or without the response selections depending upon the section of the questionnaire. The second section provides a background to the question such as why it was posed or what information was to be gained. The next section contains the responses in textual and or graphic form. The last section contains comments or observations concerning the answers.

When a specific question's detailed responses are discussed they are underlined to differentiate them from the more generalized discussions or descriptions. When percentages are given in the textual narrative to illustrate the answer in relative terms, the actual numbers of respondents are provided in parentheses to assist the reader in assessing the actual size of the response. Key findings are in italics to highlight their importance.

Section I

REQUIREMENTS FOR DIGITAL TOPOGRAPHIC DATA AND HIRUS DATA

Questionnaire Findings

Question Statement

I-1. Do you currently or expect in the future to use Digital Topographic Data (DTD) in your activities?

Background to question

This lead off question was designed to initially identify those respondents for which the questionnaire was not relevant.

Responses

Two of the 54 respondents indicated they did not have a current or future need for DTD and did not continue the questionnaire.

Comments/Observations

The low number of negative responses indicates the selectivity of the address list that focused upon those organizations that had expressed a prior interest in participating in the survey. In both cases, the negative responses occurred when the questionnaire was distributed to multiple offices within one organization.

Question Statement

I-2. What are your current applications of Digital Topographic Data (DTD) and/or your future applications?

Background to question

This question was to establish what current baseline applications and what future applications would require DTD. This question, as many in the questionnaire, encouraged multiple responses. The response choices included major simulation, operations, training, information handling and weapons systems needs. The answers were divided into current and future applications. The difference between the two response sets should represent the direction DTD requirements are going. This question begins a line of questioning that moves from general DTD needs to the assessment of a more detailed DTD data set.

Responses

Table 1 illustrates the findings in terms of numbers of answers and percentage ordered by current need . The table includes the magnitude of response change between current and future needs and the percentage of change based upon the 52 respondents. It shows the total number of responses in the 52 questionnaires and provides an average number of responses per respondent. Table 2 illustrates these same findings in ordered precedence for future applications. Table 3 illustrates the findings ordered by size of the change between the current and future needs. Figure 1 graphically compares these three using the current need order.

There were five additional "Other" responses, four of which could be considered applications.They were: Terrain Analysis (listed under tasks rather than applications), Environmental Assessments, Electromagnetic Spectrum Analysis, and Mapping. The other response, "Virtual Reality", does not appear to be either an application or a task.

CURRENT AND FUTURE USE OF DTD FOR APPLICATIONS
Ques. I-2

APPLICATIONS ORDERED BY CURRENT NEED

52 RESPONDENTS

KEY	APPLICATIONS	CURRENT	%	FUTURE	%	# CHG	%CHG
B	SIMULATION & MODELING	25	48%	38	73%	13	25%
A	MSN PLNG & REHEARSAL	21	40%	28	54%	7	14%
F	INFO COLLECTION & MGMNT	19	37%	27	53%	8	16%
D	OPERATIONAL PLANNING	18	35%	25	48%	7	13%
G	DATA FUSION & ANALYSES	14	27%	23	45%	9	18%
C	EDUCATION & TRAINING	13	25%	25	48%	12	23%
E	WPNS SYS ANALYSIS & TNG	10	19%	22	42%	12	23%
J	SYSTEMS R & D	10	19%	26	51%	16	32%
H	LOGISTICS PLANNING	7	14%	18	35%	11	21%
K	OTHER	4	8%	8	16%	4	8%
I	FACILITIES ENGINEERING	1	2%	5	10%	4	8%
	TOTAL RESPONSES	142		245		103	
	AVG # OF RESPONSES	2.7		4.7		2.0	

Table 1

CURRENT AND FUTURE USE OF DTD FOR APPLICATIONS
Ques. I-2

APPLICATIONS ORDERED BY FUTURE NEED

52 RESPONDENTS

KEY	APPLICATIONS	CURRENT	%	FUTURE	%	# CHG	%CHG
B	SIMULATION & MODELING	25	48%	38	73%	13	25%
A	MSN PLNG & REHEARSAL	21	40%	28	54%	7	14%
F	INFO COLLECTION & MGMNT	19	37%	27	53%	8	16%
J	SYSTEMS R & D	10	19%	26	53%	16	32%
D	OPERATIONAL PLANNING	18	35%	25	48%	7	13%
C	EDUCATION & TRAINING	13	25%	25	48%	12	23%
G	DATA FUSION & ANALYSES	14	27%	23	45%	9	18%
E	WPNS SYS ANALYSIS & TNG	10	19%	22	42%	12	23%
H	LOGISTICS PLANNING	7	14%	18	35%	11	21%
K	OTHER	4	8%	8	16%	4	8%
I	FACILITIES ENGINEERING	1	2%	5	10%	4	8%
	TOTAL RESPONSES	142		245		103	
	AVG # OF RESPONSES	2.7		4.7		2.0	

Table 2

CURRENT AND FUTURE USE OF DTD FOR APPLICATIONS
Ques. I-2

APPLICATIONS ORDERED BY DIFFERENCE

52 RESPONDENTS

KEY	APPLICATIONS	CURRENT	%	FUTURE	%	# CHG	% CHG
J	SYSTEMS R & D	10	19%	26	51%	16	32%
B	SIMULATION & MODELING	25	48%	38	73%	13	25%
C	EDUCATION & TRAINING	13	25%	25	48%	12	23%
E	WPNS SYS ANALYSIS & TNG	10	19%	22	42%	12	23%
H	LOGISTICS PLANNING	7	14%	18	35%	11	21%
G	DATA FUSION & ANALYSES	14	27%	23	45%	9	18%
F	INFO COLLECTION & MGMNT	19	37%	27	53%	8	16%
A	MSN PLNG & REHEARSAL	21	40%	28	54%	7	14%
D	OPERATIONAL PLANNING	18	35%	24	48%	7	13%
K	OTHER	4	8%	8	16%	4	8%
I	FACILITIES ENGINEERING	1	2%	5	10%	4	8%
	TOTAL RESPONSES	142		245		103	
	AVG # OF RESPONSES	2.7		4.7		2.0	

Table 3

CURRENT, FUTURE AND VARIANCE ÍN DTD
APPLICATONS USES
Ques I-2

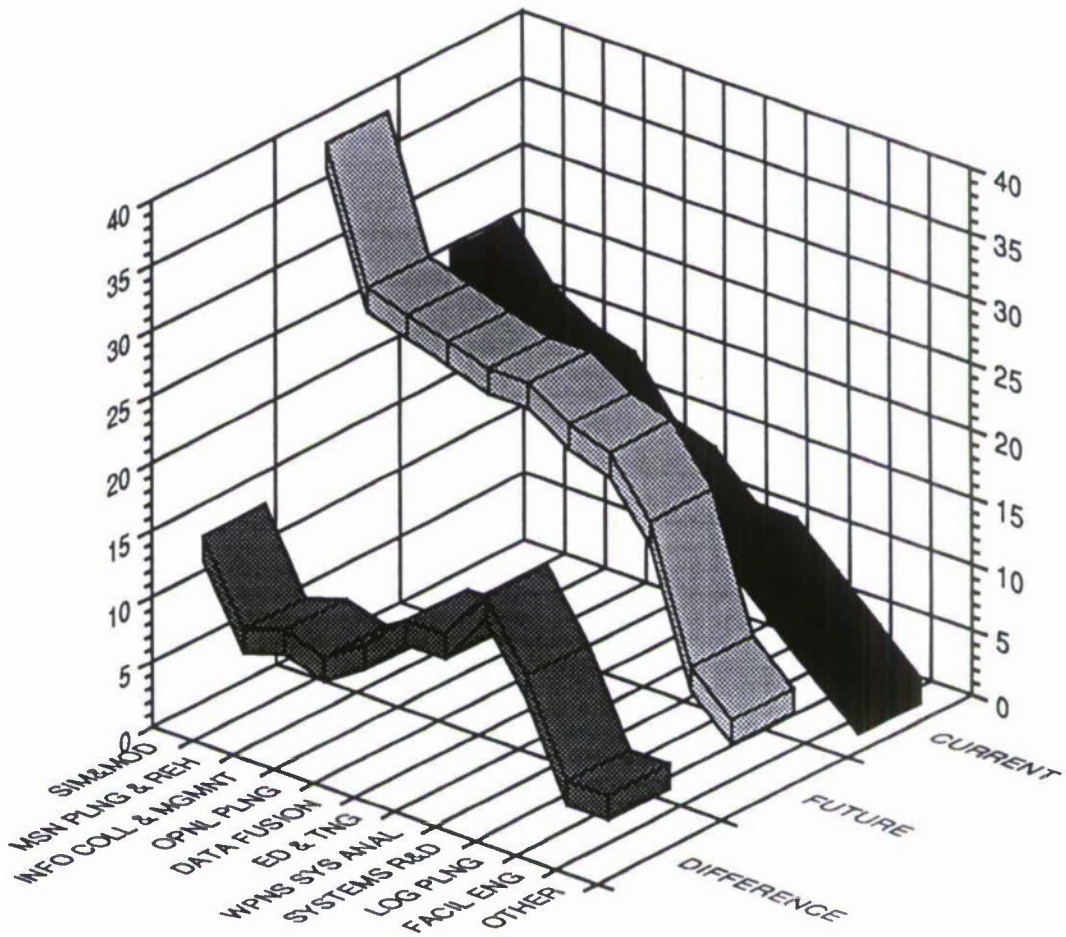


Figure 1

Comments/Observations

It is clear from this and subsequent answer sets that the spectrum of need for DTD is indeed multifaceted across a number of diverse applications. The Simulation and Modeling application is the top response for both current and future needs for DTD, garnering a 48 percent and 73 percent response rate respectively. It was clearly the primary requirement. The top four responses Simulation and Modeling, Mission Planning and Rehearsal, Information Collection and Management and Operational Planning provide a cluster that represent nearly 60% of the current applications requiring DTD based upon total responses. In terms of future needs the top three application needs remain in their respective positions with number four, Operational Planning, being replaced by Systems R&D and dropping to number five. In future applications needs, Simulation and Modeling assumes even more of a commanding lead with 73% of the respondents registering this need for DTD. However, there is obviously a desire for DTD to support other applications, because the cluster beneath number one broadens to include eight additional applications. These first nine applications represent 87% of the total responses confirming the broad based nature of future DTD needs.

Under the Systems R&D response the questionnaire asked for the system under development. The following were the responses:

- SOFATS, SOFPARS, AMPS, S2 Fusion
- Crew Stations
- Soldier System
- Signals Warfare (COMINT)
- Digital Topographic Support System
- Operational testing for new weapons systems, tactics, doctrine, force structure
- Communications, Demolitions, Munitions
- Distributed interactive simulation and training

Question Statement

I-3. Please indicate the specific tasks DTD are being used for currently and possibly in the future. (Multiple answers on both current & future OK)

Background to question

This question moves from the broader applications of the previous question to the specific tasks that DTD is and will be used for. The list of tasks included generic tasks such as Describe and Exploit the Battlefield Environment, mission applications such as Special Mission Planning and Support, and specific uses such as Line of Sight Analyses that could apply to many generic tasks and mission applications. The hybrid question approach embracing these three different types of tasks in a single question was used to elicit as much information as possible about the spectrum of DTD need.

Responses

The following three tables illustrate the DTD related tasks considered important by the respondents. The first table, Table 4 shows current task requiring DTD in rank order. The second table, Table 5 illustrates the future tasks requiring DTD, also in rank order of responses. The last table, Table 6 is ordered by the amount of change between the current and future needs to illustrate those areas believed to be the most important candidates for DTD applications. Note that there is a doubling of the number of responses between the current and future columns, indicating a high degree of multi-task interest; this indicates potential growth in tasks requiring DTD in the future. All of the respondents indicated they had multiple tasks needing DTD, with an average number of 13 different tasks per respondent.

DTD TASKS Ques I-3

TASKS ORDERED BY CURRENT NEED

52 RESPONDENTS

KEY	TASK DESCRIPTION	CURR #	%	FUT #	%	DIFF	% CHG*
D	TERRAIN PROFILES	34	65%	45	87%	11	22%
A	D&E BATTLEFIELD ENVRNMNT	24	46%	38	73%	14	27%
BB	MAP BACKGROUNDS	22	42%	31	60%	9	18%
B	TACTICAL DECISION AIDS	20	38%	35	67%	15	29%
Q	LINE OF SIGHT ANALYSES	20	39%	31	60%	11	21%
C	MOBILITY ANALYSIS	19	37%	29	56%	10	19%
AA	SITUATION DISPLAYS	18	35%	31	60%	13	25%
I	CMND & CNTRL PLNG & SPT	17	33%	26	50%	9	17%
F	FOF/OBSERV PLNG & SPT	16	31%	28	54%	12	23%
Z	SCENARIO PLANNING	15	29%	33	63%	18	34%
K	SPCL MSN PLNG & SPT	15	29%	31	60%	18	31%
H	AVIATION MSN I&E SPT	14	27%	22	42%	8	15%
G	MANEUVER SUPPORT	14	27%	21	40%	7	13%
E	TGT ACQ PLOTS	11	21%	22	42%	11	21%
P	COUNTER NARCOTICS SPT	9	17%	28	54%	19	37%
J	COMMUNICATIONS PLNG & SPT	8	15%	22	42%	14	27%
V	TGT SCENE MODELING	8	15%	25	48%	17	33%
W	URBAN TERRAIN VISUALIZATION	7	13%	32	62%	25	49%
T	OBJECTIVE ID & ANALYSIS	6	12%	20	38%	14	26%
S	AIR/GRD LIAISION	5	10%	14	27%	8	17%
X	AOR ANALYSIS & ASGNMNT	5	10%	17	33%	12	23%
M	COUNTERTERRORIST SPT	5	10%	24	46%	19	36%
O	NON-ESSEN CIV EVAC SPT	5	10%	19	37%	14	27%
L	MIL PEACEKEEPING SPT	4	8%	15	29%	11	21%
U	PHYSICAL VULNER ANALYSES	4	8%	16	31%	12	23%
R	FACILITIES MGMNT	2	4%	6	12%	4	8%
Y	SPATIAL ARCHIVE OF PREC PTS	2	4%	11	21%	9	17%
CC	OTHER	2	4%	3	6%	1	2%
N	LAWS OF ARMED CNFLT COMPL	1	2%	5	10%	4	8%
	TOTAL RESPONSES	332		680		348	
	AVG # OF RESP	6.4		13.1		6.7	

* percentage calculated by subtracting current percent from future percent

Table 4

DTD TASKS QUES I-3

TASKS ORDERED BY FUTURE NEED

52 RESPONDENTS

KEY	TASK DESCRIPTION	CURR #	%	FUT #	%	DIFF	% CHG*
D	TERRAIN PROFILES	34	65%	45	87%	11	22%
A	D&E BATTLEFIELD ENVRNMNT	24	46%	38	73%	14	27%
B	TACTICAL DECISION AIDS	20	38%	35	67%	15	29%
Z	SCENARIO PLANNING	15	29%	33	63%	18	34%
W	URBAN TERRAIN VISUALIZATION	7	13%	32	62%	25	49%
BB	MAP BACKGROUNDS	22	42%	31	60%	9	18%
AA	SITUATION DISPLAYS	18	35%	31	60%	13	25%
K	SPCL MSN PLNG & SPT	15	29%	31	60%	18	31%
Q	LINE OF SIGHT ANALYSES	20	39%	31	60%	11	21%
C	MOBILITY ANALYSIS	19	37%	29	56%	10	19%
P	COUNTER NARCOTICS SPT	9	17%	28	54%	19	37%
F	FOF/OBSERV PLNG & SPT	16	31%	28	54%	12	23%
I	CMND & CNTRL PLNG & SPT	17	33%	26	50%	9	17%
V	TGT SCENE MODELING	8	15%	25	48%	17	33%
M	COUNTERTERRORIST SPT	5	10%	24	46%	19	36%
J	COMMUNICATIONS PLNG & SPT	8	15%	22	42%	14	27%
H	AVIATION MSN I&E SPT	14	27%	22	42%	8	15%
E	TGT ACQ PLOTS	11	21%	22	42%	11	21%
G	MANEUVER SUPPORT	14	27%	21	40%	7	13%
T	OBJECTIVE ID & ANALYSIS	6	12%	20	38%	14	26%
O	NON-ESSEN CIV EVAC SPT	5	10%	19	37%	14	27%
X	AOR ANALYSIS & ASGNMNT	5	10%	17	33%	12	23%
U	PHYSICAL VULNER ANALYSES	4	8%	16	31%	12	23%
L	MIL PEACEKEEPING SPT	4	8%	15	29%	11	21%
S	AIR/GRD LIAISION	5	10%	14	27%	9	17%
Y	SPATIAL ARCHIVE OF PREC PTS	2	4%	11	21%	9	17%
R	FACILITIES MGMNT	2	4%	6	12%	4	8%
N	LAWS OF ARMED CNFLT COMPL	1	2%	5	10%	4	8%
CC	OTHER	2	4%	3	6%	1	2%
	TOTAL RESPONSES	332		680		348	
	AVG # OF RESP	6.4		13.1		6.7	

* percentage calculated by subtracting current percent from future percent.

Table 5

DTD TASKS QUES I-3

TASKS ORDERED BY CHANGE DIFFERENCE

52 RESPONDENTS

KEY	TASK DESCRIPTION	CURR #	%	FUT #	%	DIFF	% CHG*
W	URBAN TERRAIN VISUALIZATION	7	13%	32	65%	25	49%
P	COUNTER NARCOTICS SPT	9	17%	28	54%	19	37%
M	COUNTERTERRORIST SPT	5	10%	24	46%	19	36%
Z	SCENARIO PLANNING	15	29%	33	63%	18	34%
V	TGT SCENE MODELING	8	15%	25	48%	17	33%
K	SPCL MSN PLNG & SPT	15	29%	31	60%	16	31%
B	TACTICAL DECISION AIDS	20	38%	35	67%	15	29%
J	COMMUNICATIONS PLNG & SPT	8	15%	22	42%	14	27%
O	NON-ESSEN CIV EVAC SPT	5	10%	19	37%	14	27%
A	D&E BATTLEFIELD ENVRNMNT	24	46%	38	73%	14	27%
T	OBJECTIVE ID & ANALYSIS	6	12%	20	38%	14	26%
AA	SITUATION DISPLAYS	18	35%	31	60%	13	25%
U	PHYSICAL VULNER ANALYSES	4	8%	16	33%	12	23%
X	AOR ANALYSIS & ASGNMNT	5	10%	17	33%	12	23%
F	FOF/OBSERV PLNG & SPT	16	31%	28	54%	12	23%
D	TERRAIN PROFILES	34	65%	45	87%	11	22%
L	MIL PEACEKEEPING SPT	4	8%	15	29%	11	21%
E	TGT ACQ PLOTS	11	21%	22	42%	11	21%
Q	LINE OF SIGHT ANALYSES	20	39%	31	60%	11	21%
C	MOBILITY ANALYSIS	19	37%	29	56%	10	19%
BB	MAP BACKGROUNDS	22	42%	31	60%	9	18%
Y	SPATIAL ARCHIVE OF PREC PTS	2	4%	11	22%	9	17%
S	AIR/GRD LIAISION	5	10%	14	27%	9	17%
I	CMND & CNTRL PLNG & SPT	17	33%	26	50%	9	17%
H	AVIATION MSN I&E SPT	14	27%	22	42%	8	15%
G	MANEUVER SUPPORT	14	27%	21	40%	7	13%
R	FACILITIES MGMNT	2	4%	6	12%	4	8%
N	LAWS OF ARMED CNFLT COMPL	1	2%	5	10%	4	8%
CC	OTHER	2	4%	3	6%	1	2%
	TOTAL RESPONSES	332		680		348	
	AVG # OF RESP	6.4		13.1		6.7	

* percentage calculated by subtracting current percent from future percent.

Table 6

Comments/Observations

The previous three tables in concert with the first three tables may be the most important findings in the entire report as they clearly lay out, first by mission area applications and secondly by detailed tasks, the current and future requirements for digital topographic data.

The questionnaire confirms the traditional uses of DTD; the top seven tasks are generic DTD uses - Terrain Profiles, Describe and Exploit the Battlefield Environment, Map Backgrounds and Situation Displays, Tactical Decision Aids as well as Line Of Sight Analyses and Mobility Analyses.

Table 4 shows these top seven generic tasks, as opposed to mission specific tasks, account for nearly half (47%) of the 332 responses concerning current DTD uses. 65 percent (34) of the respondents indicate that *Terrain Profiles is the primary current requirement for DTD*, significantly beyond the second task, Describe and Exploit the Battlefield Environment at a 46 percent (24) response. The first set of mission tasks are at rankings 8 through 10 with half the number of responses recorded. These tasks include: Command and Control and Special Mission Planning and Support, and Fields of Fire/Observation Support. It appears that *DTD uses are associated much more with generic tasks than with specific mission type tasks,* notwithstanding that these generic tasks often support the mission tasks.

Table 5 depicts the future tasks expected by the respondents, to be supported by DTD. It is significant that the total responses doubled between the current and future tasks from 332 to 680. The respondents expect a significant expansion in the future use of DTD to address a broad spectrum of their needs. Equally significant is the fact that the top seven current generic tasks remain in the top third of the future rankings. They are joined by several new tasks, both generic and specific, including Urban Terrain Visualization, Special Mission Planning and Support, and Situation Planning. *Terrain Profiles remains the top ranked task with 87 percent (45) of the respondents indicating this was the significant task for DTD.*

Table 6 illustrates those tasks that had the greatest growth in responses between the current and future assessments. *Urban Terrain Visualization represented the greatest growth.* Sixty five percent of the respondents indicated that they desired DTD for this

task in the future - a 49 percent change. The second and third largest in growth were two new and challenging mission support areas for the military services - Counter Narcotic Support and Counter terrorist Support, both with close ties to the urban environment. The next two largest growth tasks underscores the desires of the simulation and modeling applicators as well as the mission support functions; these were Scenario Planning and Target Scene Modeling. In terms of growth, the traditional DTD tasks of Terrain Profiles, Line Of Sight Analyses, Mobility Analyses, and Map Backgrounds saw lower levels of response growth, but still enough to keep them near the top of the list.

There were several additional tasks listed in the Other category. They included the following:

- Natural and Cultural Resource Management
- Target Masking & Flight Line Masking
- Simulation of local area NBC effects (cloud movement)
- Virtual Reality

Question Statement

I-4. What scale(s) of data do your current applications need? (multiple answers OK)

Background to question

This question continues to establish the parameters required by DTD users. The six answers span the scale spectrum from approximately 1:250,000 (represented as ≤1:50,000) to scales greater than 1:5,000 (the nominal scale of a proposed HIRUS data set). This query solicits multiple responses as most organizations work across a spectrum of scales.

Responses

The responses confirm the *multi-scale interest of the respondents* even at this detailed end of the scale spectrum. Table 7 illustrates this in a matrix of responses. A single entry in a row indicates only one scale was desired and it is the scale of that heading. Numbers in rows under multiple headings indicate several scales were desired. The number in the horizontal rows indicates the number of responses in such a combination. Aggregate totals, and one and multi-scale totals are at the bottom of the matrix. Figure 2 shows the aggregated data.

WHAT DATA SCALES ARE NEEDED FOR YOUR APPLICATIONS
Ques I-4

52 RESPONDENTS

SCALE KEY	Required Data Scales <1:50K A	1:50K B	1:25K C	1:10K D	1:5K E	>1:5K F	
	Number of Responses						
	2						
	1		1	1	1		
	1		1			1	
	2			2	2		
	6	6					
	1	1	1			1	
	1	1	1		1		
	1	1	1			1	
	8	8	8				
	1	1	1	1			
	1	1	1	1	1		
	6	6	6	6	6	6	
		4					
		4	4				
		1	1		1		
		1	1			1	
		1			1		
			1				
				1			
		1				1	
		2	2	2	2	2	
			1		1		
				1	1	1	
					2		
						1	
TOTAL	31	39	30	15	19	15	146
ONE SCALE	2	4	1	1	2	1	11
MULTI SCALES	29	35	29	14	17	14	135

Table 7

Explanatory Note: The numbers in the horizontal column(s) indicate the total number of responses requesting a single or combinations of different data scales. For example, the 2 under <1:50K indicates two respondents wanted only this scale. The 6 in the <1:50K and 1:50K columns indicated that six respondents wanted these two scales.

SCALES REQUIRED
Ques I-4

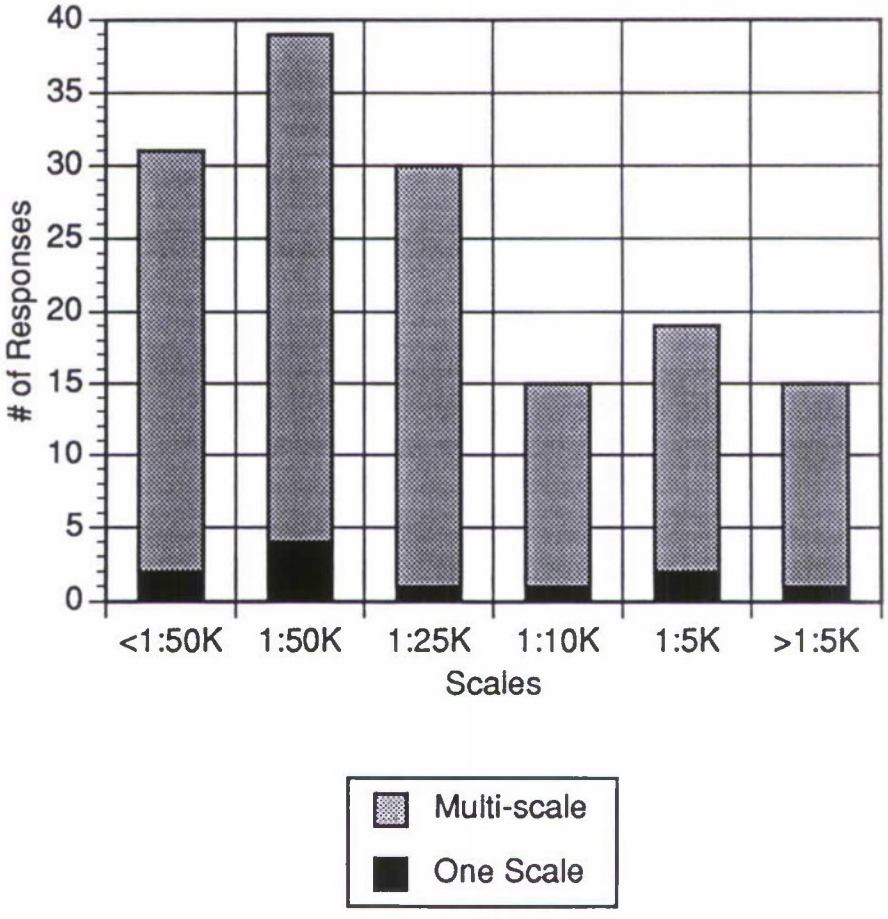


Figure 2

Comments/Observations

Unquestionably, the need is for multi-scales including large scales. *Ninty three percent of the responses (135) indicated multi-scales* were desired.Twenty One percent (30) indicated they needed 1:25,000, at which scale very little data currently exists. *One third of the responses (49) wanted scales larger than 1:25,000* where there is virtually no data at the present time.

Question Statement

I-5. What do you consider "high resolution" data? (Answers are in ground resolution distance - multiple answers OK)

Background to question

This question begins a sub section of part one dealing with the requirements for high resolution data.

A particularly vexing problem that permeates the high resolution issue is "What is exactly meant by the term - high resolution". Although it is easy to say that it is in the eye of the beholder, and this may be true, any requirements study must ultimately grapple with the bounding of what is meant so that data can be produced in a standard manner. Thus, this question was posed to ascertain what this group of respondents thought was meant by the term "high resolution". The quantification approach taken was to use imagery interpretation terms rather than map scales. Although scale was the accepted measure of merit for earlier airborne photo systems, it was replaced in the satellite era by ground resolved distance (GRD) to describe with a distance on the ground that can be distinguished on an image. This question has its responses in GRD. The range of responses corresponds to a metric generalization of a portion of the National Imagery Interpretation Rating Scale (NIIRS).

Responses

The data is presented in both tabular and graphic forms. Table 8 is a matrix of answers showing the multiplicity of responses across the scale. Figure 3 provides a graphic comparison.

WHAT IS HIGH RESOLUTION DATA
Ques I-5

	Ground Resolved Distance							
	>10m	10m	5m	2.5m	1.5m	.75m	.5m	<.5m
KEY	A	B	C	D	E	F	G	H
	Number of Responses							
	4							
	2	2						
	1		1					
	1			1				1
	1	1	1	1	1	1	1	
		8						
		1	1	1	1	1	1	1
		1		1				
		1			1			
		1						1
			4					
			1	1				
			1		1			
			1	1	1			
			1	1	1	1		
			2	2	2	2	2	2
				3				
				1	1			
					4			
					1	1	1	1
						1		
						1	1	
						1	1	1
							4	
								4
TOT	9	15	13	13	14	9	11	10
ONE	4	8	4	3	4	1	4	4
MULTI	5	7	9	10	11	8	7	6

TOTAL	94
ONE GRD	32
MULTI GRD	62

Table 8

REQUIRED GROUND RESOLVED DISTANCE
Ques I-5

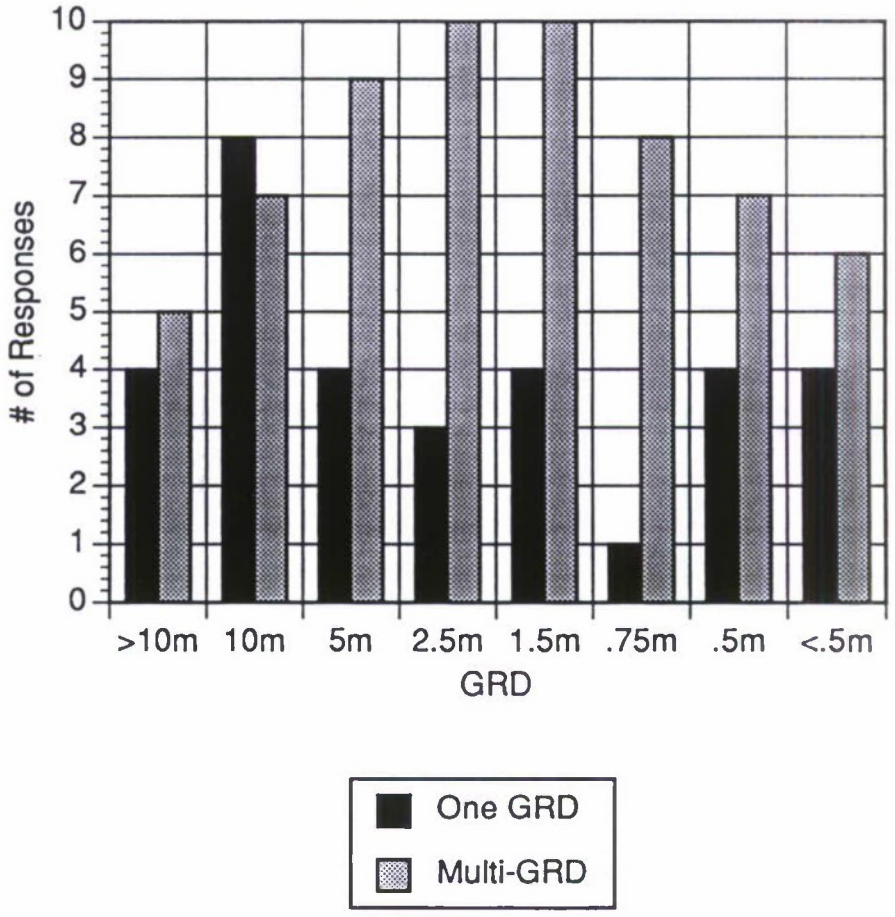


Figure 3

Comments/Observations

There were 94 total responses to the question. Thirty-four percent (32) responded with a single GRD. Of that number,12 identified high resolution data as a GRD of 10 meter or greater. Over two thirds of the total responses (62) answered with multiple resolutions. Seventy percent (44) of them fell within the less-than-5 meter to 1.5 meter range. It is significant to note that *approximately one third of both the total responses (30) and the multi-GRD responses (21) fell within the range of less than one meter GRD.* Over one quarter of the single GRD responses fell at this high detail end of the spectrum. Conversely, on the other end of the scale, only 13 percent (4) of the total respondents indicated high resolution was over 10 meters.

As Table 8 illustrates over 90 percent of the respondents believe high resolution data is 10 meter GRD or less with 75% stating it is 5 meters or below. Nearly one half of the respondents found it to be 1.5 meter GRD or below. *The implications for any high resolution data base is that the potential users interested in high resolution data truly believe it is very detailed in nature.*

One respondent added a comment that underscores the detail required for some applications, in this case Special Operations: ".5 to 1 foot will be generated in target area for combat mission rehearsal SOFATS".

Question Statement

I-6. Do you currently use or require high resolution data for your applications?

Background to question

This question establishes what population of the surveyed organizations use high resolution data currently, and secondly, do they need high resolution data now.

Responses

This was a two query question using a yes/no format.

Comments/Observations

Thirty-nine percent (22) of the respondents said they use high resolution data whereas 61 percent (30) said they do not. Seventy-

nine percent (41) of the respondents said they need high resolution data now and only 21 percent (11) indicated they did not.

This is the first question that defines who is using high resolution data and who requires it for current applications. As such it is a benchmark of the current constituency and an indication of today's need for this type of detailed information.

Question Statement

I-7. Do you anticipate the need for digital high resolution data for your future applications within the next 1 to 5 years?

Background to question

This question continues the line of questioning began in the previous question. This question addresses the future need.

Responses

It is a yes/no question.

Comments/Observations

Ninety-six percent (50) of the respondents indicate a future need for high resolution data.

Question Statement

I-8. If digital high resolution data (eg. 1:5,000 scale) were available, would you or could you use it in your current or future applications?

Background to question

Recognizing the reality that if something exists most people will use it, this question solicits those that would use a high resolution data set if it existed.

Responses

This is a yes/no question.

Comments/Observations

The response was unanimous. *If it existed, all respondents indicated they would use a high resolution data set*, even those who indicated they did not have a need for it in the future.

Question Statement

I-9. If available, what missions applications would it support? (multiple answers OK)

Background to question

This question continues question I-8 by soliciting the uses of a nominal 1:5000 scale data set were it to exist. The responses are keyed to the applications first enumerated at the outset of the questionnaire. The question provides additional use data and serves as a cross-check of question I-2.

Responses

Table 9 provides the tabulation of the anticipated uses as well as a comparison with the current uses stated in question I-2 previously. Figure 5 graphically compares the magnitude of responses between questions I-2 current and future and question I-9. In virtually all cases, the I-9 responses exceed both the current and future I-2 responses.

HI RES USE IF AVAILABLE

Ques I-9

52 RESPONDENTS

KEY	APPLICATIONS			QUES I-2 CURRENT NEEDS
B	SIMULATION & MODELING	43.	84%	SIMULATION & MODELING
D	OPERATIONAL PLANNING	34	67%	MSN PLNG & REHEARSAL
F	INFO COLLECTION & MGMNT	28	55%	INFO COLLECTION & MGMNT
A	MSN PLNG & REHEARSAL	28	55%	OPERATIONAL PLANNING
G	DATA FUSION & ANALYSES	27	53%	DATA FUSION & ANALYSES
C	EDUCATION & TRAINING	25	48%	EDUCATION & TRAINING
E	WPNS SYS ANALYSIS & TNG	20	39%	WPNS SYS ANALYSIS & TNG
J	SYSTEMS R & D	15	29%	SYSTEMS R & D
H	LOGISTICS PLANNING	14	27%	LOGISTICS PLANNING
K	OTHER	4	8%	OTHER
I	FACILITIES ENGINEERING	2	4%	FACILITIES ENGINEERING
	TOTAL RESPONSES	239		
	AVG # OF RESPONSES	4.7		

Table 9

COMPARISON OF Ques I-2 and I-9 DATA
CONCERNING DTD USES

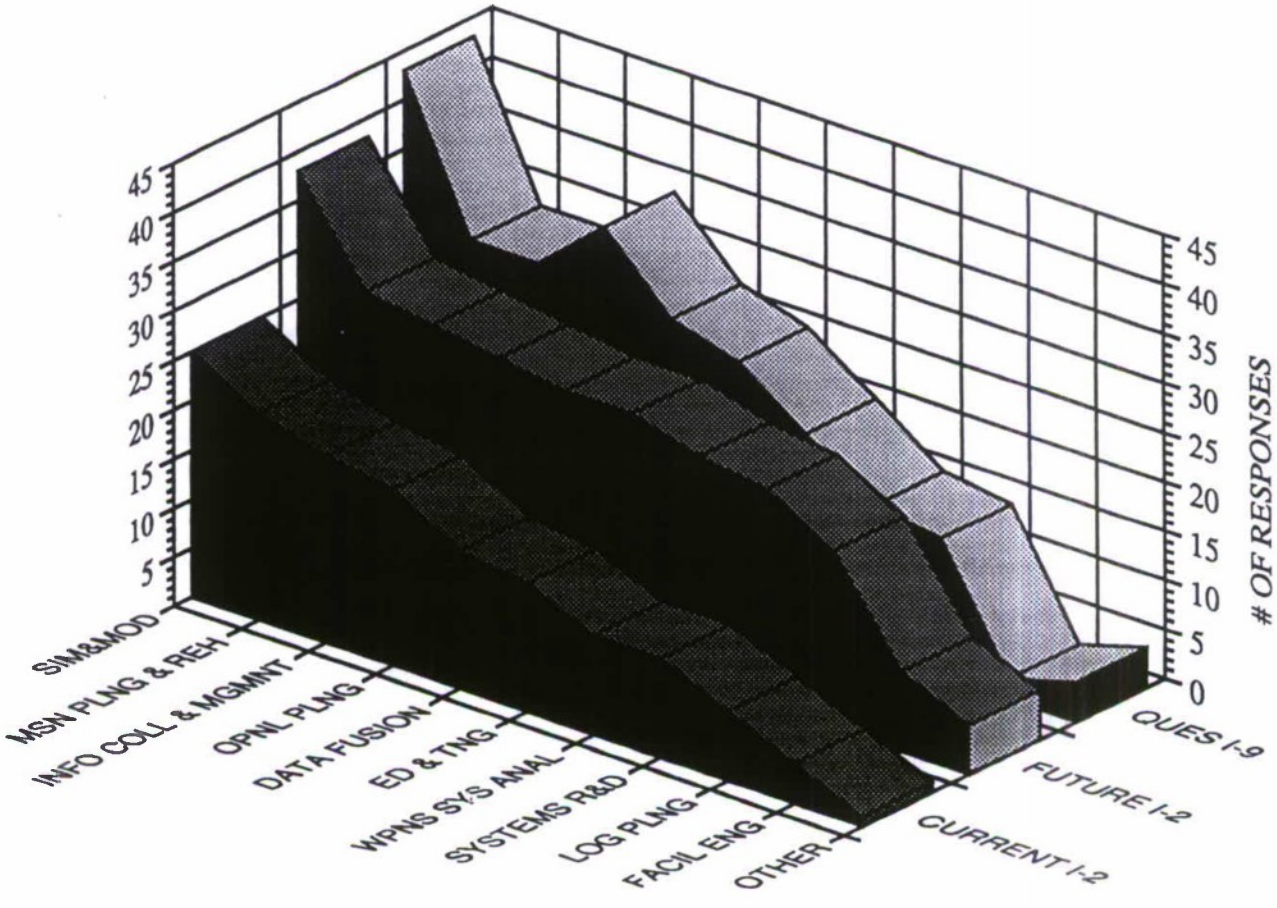


Figure 4

Comments/Observations

The applications responses for this question and question I-2 are virtually the same. Only Mission Planning and Rehearsal and Operational Planning were transposed in this question. Since these two applications are very close, there is not substantial difference in the findings. This confirms the question I-2 data as well as underscores the current need for DTD.

Several respondents added some other categories to this question. They included Targeting, and Counter Drug Operations.

I-10. What locational coordinate system(s) are required by your current or future DTD applications? (If multiple systems, please indicate)

Background to question

One of the most important requirements for DTD is to relate its spatial location in a form familiar to the user. This is usually in the form of standard coordinate systems used by the Department of Defense. This question selects the popular coordinate systems and asks which are required by the users' systems.

Responses

Table 10 provides a matrix for this multiple answer question. The choices in the table are as follows: LATLON = geographic latitude and longitude; GEODETC = geodetic coordinates (latitude, longitude and height); MGRS = Military Geographic Reference System; UTM = Universal Transverse Mercator; OTHER = Other coordinate systems not specified; NOPREF = No preference for coordinate systems; UNKNOWN = Don't know what system is required.

Comments/Observations

Comments: The matrix underscores that most users require specific, multiple coordinate systems. Of the 151 responses, only 1 indicated no preference in systems, and only 6 responded that a single coordinate system was satisfactory. The remainder desired multiple systems. This can be seen in that over one half of the individual responses came from a group of 19 respondents that indicated they wanted all of the named coordinate systems. The responses were fairly evenly spread among the four named coordinate systems. One quarter (36) desired latitude/longitude. A similar percentage (36) desired geodetic data. 28 percent (42) wanted UTM and 21 percent (31) desired MGRS. The "other"

coordinate systems entered included GEOREF, WGS84 and Albers Equal Area, the latter two being a spheroid and a map projection respectively. Nevertheless, these responses indicate the recognition that these elements are essential in the derivation of "good" coordinates.

WHAT LOCATIONAL COORDINATE SYSTEMS ARE REQUIRED?
Ques I-10

	Required Coordinate Systems						
	LATLON	GEODETC	MGRS	UTM	OTHER	NOPREF	UNKNOWN
KEY	A	B	C	D	E	F	G
				Number of Responses			
	1						
	19	19	19	19			
	2	2	2	2	2		
	3	3		3			
	2		2				
	3		3	3			
	4			4			
	2			2	2		
			1	1	1		
		3					
		3	3				
		1	1	1			
		5		5			
				2			
						1	
TOTAL	36	36	31	42	5	1	
ONE SCALE	1	3	0	2	0	1	
MULTI-SCALES	35	33	31	40	5	0	

TOTAL	151
ONE SCALE	7
MULTI-SCALES	144

Table 10

Question Statement

I-11. What most stringent horizontal locational accuracy is or would be required by your applications using high resolution data?

Background to question

One of the criteria that affects the fidelity and cost of high resolution data is its locational accuracy. This question asks for the most stringent accuracy the user would require to support his activities or systems, current or future. There was no attempt to differentiate between absolute and relative accuracies in this question. The thrust was to ascertain the range of accuracies desired and with the following question to determine what was driving these accuracy requirements.

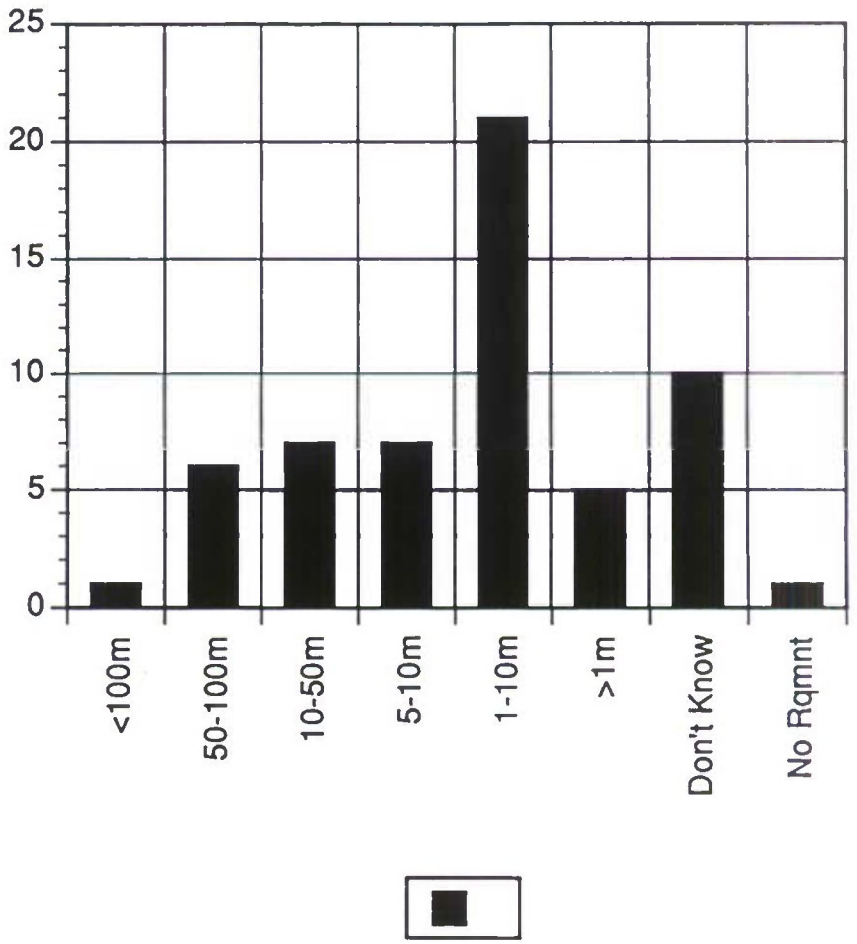
Responses

The question has a flaw in one of the responses. Response E should have read 1-5m rather than 1-10m. Figure 5 shows the responses in graphic form.

Comments/Observations

Forty-eight percent (28) indicated they wanted accuracies between 1-10 meters. Seventeen percent (10) indicated they did not know their need and one had no requirement. The question asks for the most demanding requirement; four respondents provided a range that has been included.

HORIZONTAL ACCURACY
Ques I-11



	1	6	7	7	21	5	10	1

Figure 5

Question Statement

I-12. What developmental or operational system or doctrine requirements drive your horizontal accuracy requirement?

Background to question

It is important to relate an accuracy requirement with a finite need. Too often requirements are stated based on arbitrary decisions rather than based upon the actual derived need of a supported system. This may significantly affect the cost of providing data at such an accuracy or kill the requirement entirely as cost prohibitive. Most new products with today's constrained resource environment will require substantial justification for a demanding accuracy statement.

Responses

Over 80 percent (42) of the respondents provided a requirement statement for their accuracy needs. Based upon past experiences of trying to solicit this type of justification, it is gratifying to see a high response rate, even if some of the responses are general in nature.

Comments/Observations

Appendix 2 lists these requirements. The importance of these widely varying types and presentations of requirements is that there is a very broad population of potential users that believe that high resolution data will enhance their capabilities. One might quibble with some of the requirements statements, but in aggregate they represent a significant spectrum of need.

Question Statement

I-13. What vertical accuracies are or would by required for your DTD applications?

Background to question

This is the companion query to question I-11 on accuracies. This question addresses vertical accuracy.

Response:

There were 52 responses to the question.

Comments/Observations

Sixty-nine percent (36) wanted source accuracy and 27 percent (14) indicated they did not know their requirements. Four percent (2) of the respondents said they had no vertical accuracy requirement. This relatively low number stating a need and the high number not knowing their requirement indicates that more dialogue may be necessary concerning vertical accuracies.

Question Statement

I-14. What developmental or operational systems or doctrine requirement drives your vertical accuracy requirement?

Background to question

This question is the companion to question I-12 asking for accuracy justification for the vertical accuracy.

Responses

Over two thirds (35) provided a justification. Although not up to the 80 percent for horizontal accuracy, it represents a sizeable response to the question. Two respondents that indicated they had a vertical accuracy did not provide the requirement justification.

Comments/Observations

Justifications are in Appendix 3. Many of the respondents listed the same requirements for both their horizontal and vertical accuracies. Like the horizontal accuracies listed in Appendix 2, these accuracies are varied and often far ranging. Nevertheless, they argue for serious consideration be given for the users' needs high resolution data.

Question Statement

I-15. Do you currently use or would you use in the future Advanced Terrain Visualization, 3 Dimensional (3D) or Perspective View (ie. features with associated elevation values at each of their coordinate pairs) information for your applications?

Background to question

This question moves to a new area of inquiry. It concerns what is referred to as "perspective views", or "three dimensional (3D) views" or "Advanced Terrain Visualization or ATV". These techniques have become very popular uses of DTD, particularly using Digital

Terrain Elevation Data (DTED) draped with a map or image to permit realistic "fly throughs" of terrain or using different information "drive throughs or walk throughs" of urban environments. This question addresses the need for this functionality and the supporting data necessary to permit these activities.

Responses

The question is framed as a double yes/no query with separate responses for current and future applications.

Comments/Observations

Forty-six percent (24) of the respondents indicated they have a current need for ATV. This grew to all of the respondents in the future. This appears to be a highly desirable capability for most users.

Question Statement

I-16. If yes, how do you or would you use these ATV/3D data for your applications?

Background to question

The next two questions ask what uses are or will be made of ATV. This question addresses the current uses. Six general headings were provided plus an "other" answer with a request to specify the application.

Responses

This is a multiple answer question. Tables 11 and 12 provide tabulations of the responses ordered first by current and then by future need. Figure 6 shows these graphically. Two Other responses were given. They were Targeting and Contour Interpolation.

CURRENT AND FUTURE NEED FOR ATV
Ques I-16

ATV NEEDS ORDERED BY CURRENT NEED
52 RESPONDENTS

KEY	APPLICATIONS	CURRENT	%	FUT	%	# CHG	% CHG
B	LINE OF SIGHT ANALYSES	21	41%	32	63%	11	22%
A	MODELING	14	27%	38	75%	24	47%
D	MISSION SIMULATIONS	12	24%	34	67%	22	43%
C	OPERATIONAL PLANNING	12	24%	30	58%	18	34%
F	TRAINING	11	22%	26	50%	15	28%
E	RESEARCH & DEVELOPMENT	9	18%	14	27%	5	10%
G	OTHER	2	4%	4	8%	2	4%
	TOTAL RESPONSES	81		178		97	
	AVG # OF RESPONSES	1.6		3.4		1.8	

Table 11

CURRENT AND FUTURE NEED FOR ATV
Ques I-16

ATV NEEDS ORDERED BY FUTURE NEED
52 RESPONDENTS

KEY	APPLICATIONS	CURRENT	%	FUT	%	# CHG	% CHG
A	MODELING	14	27%	38	75%	24	47%
D	MISSION SIMULATIONS	12	24%	34	67%	22	43%
B	LINE OF SIGHT ANALYSES	21	41%	32	63%	11	22%
C	OPERATIONAL PLANNING	12	24%	30	58%	18	34%
F	TRAINING	11	22%	26	50%	15	28%
E	RESEARCH & DEVELOPMENT	9	18%	14	27%	5	10%
G	OTHER	2	4%	4	8%	2	4%
	TOTAL RESPONSES	81		178		97	
	AVG # OF RESPONSES	1.6		3.4		1.8	

Table 12

CURRENT AND FUTURE USES
OF ADVANCED TERRAIN
VISUALIZATION
Ques I-16

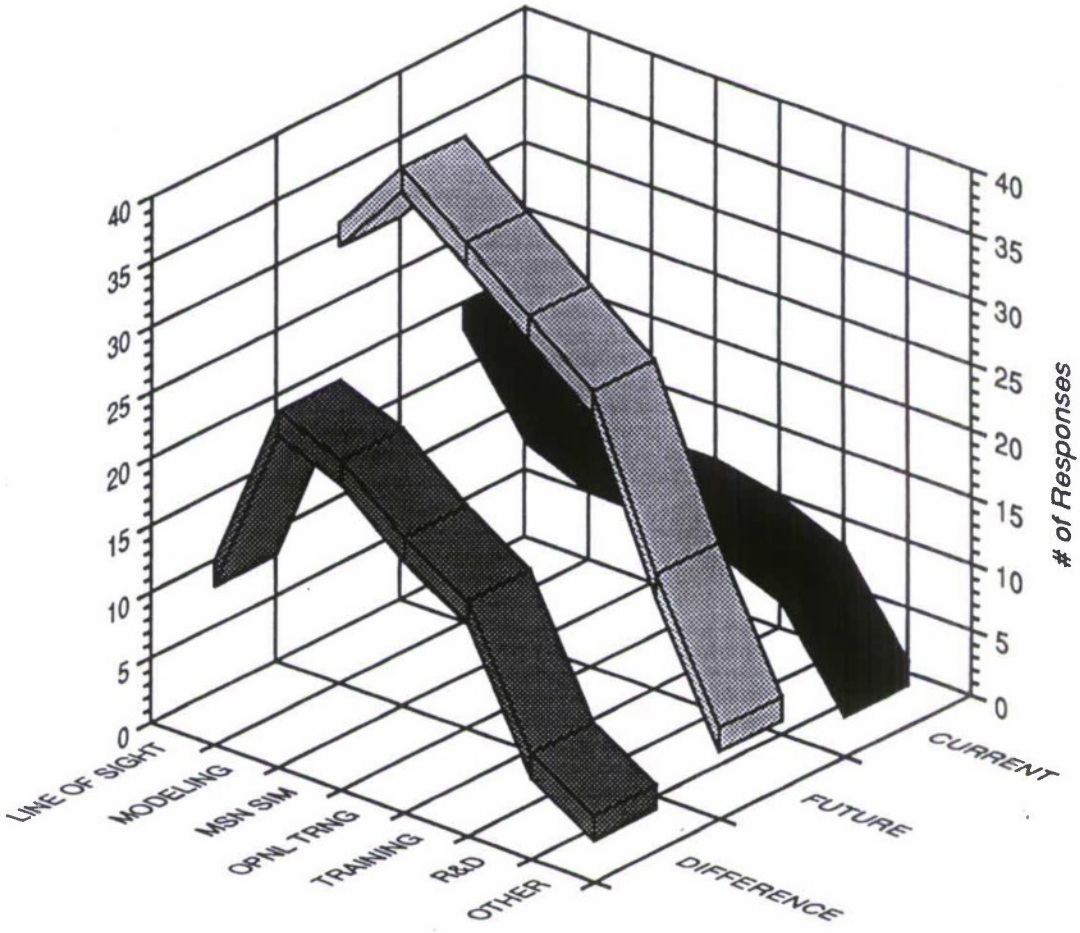


Figure 6

Comments/Observations

Line of sight analyses is the major single current use of ATV said forty one percent (21) of the respondents followed by Modeling, and Mission Simulations. Modeling is the first future use of ATV with three quarters (38) of the respondents so indicating. In second place for future applications is again Mission Simulations. Line of Sight Analyses slipped to third for future applications.

Question Statement

I-17. How do you want perspective views? (Multiple answers OK)

Background to question

There are several ways to consider ATV depending upon the use. They fall into two general categories; how the view is done, and from where it is done. This question addresses both of these conditions in a single question. The first part of the question asks HOW the view is done. For example, "do you want the point of origin to be your view?" This could be important in direct fire or line of sight calculations for microwave sitings. Or, "do you want the point of origin from an external point, such an opponent's view looking toward you?" This would be important in cover and concealment considerations or your unobserved movement behind hills or trees.

The second part of the question addresses whether the observations will be made from ground level to ground level, or whether the observer will be making above ground to ground level observations. Although the latter could be important for aviation applications it could also be uses in determining the "look" of a tower mounted microwave dish.

Responses

This is a multiple response question. Two of the answers were aggregations of several individual responses. Table 13 shows the answer matrix. The matrix has been corrected for double counting. Several of the respondents registered answers for both the singular views and positions as well as the aggregations. The correction registers just a single response if it is an aggregation. One respondent did not answer the view part but did answer the position part.

HOW DO YOU WANT TO SEE PERSPECTIVE VIEWS
Ques I-16

52 RESPONDENTS

KEY	RESPONSE	#
A	YOUR VIEW	5
B	OPPONENTS VIEW	0
C	BOTH VIEWS	45
D	NO PREFERENCES	1
E	GROUND TO GROUND	4
F	AIR TO GROUND	2
G	BOTH VIEWS	44
H	DON'T KNOW	0

Table 13

Comments/Observations

Most respondents want the capability for both views and the ability to adjust the altitude of the viewer (ie., have an air to ground view or vice versa).

Question Statement

I-18. What data formats do your applications require? (See Data Format Examples, Figure 2, page 23)

Background to question

This is the final question in section one of the questionnaire. It asks for the data format or format combinations that a new high resolution data set should accommodate. There were three format choices - two as single answers, one as the combination of two of these formats, and one as a combination of all three.

Responses

Table 14 illustrates the findings in rank order. Although this was intended to be a single answer question, four respondents gave multiple answers which have been corrected to represent 52 respondents. Like a previous question this was the case of marking both the single and aggregate answer.

WHAT DATA FORMATS DO YOU WANT
Ques I-18

52 RESPONDENTS

KEY	FORMATS	#
D	RASTER, VECTOR, GRIDDED	24
C	RASTER AND VECTOR	16
A	RASTER ONLY	4
B	VECTOR ONLY	4
F	DON'T KNOW	3
E	NO PREFERENCE	1

Table 14

Comments/Observations

Comments: Most of the respondents (77%) recognize the desirability of using multiple data formats. Forty-six percent (24) so indicated they wanted all formats. Those wanting raster and vector registered 31 percent (16). Single format users accounted for a very small response regardless of which type of format.

Section II

REQUIREMENTS FOR HIRUS DATA CONTENT

Introduction

The second part of the questionnaire solicited information concerning the desired content of a proposed high resolution urban specific data set. There is a high conceptual association of such a new data set with existing cartographic conventions. Therefore the feature content tables used in the questionnaire were drawn for the most part from cartographic specifications. This was opportune for several reasons. First, it was a quick method of representing many of the feature needs below the installation level of information in an organized manner. Second, using already established feature identification conventions would maintain compatibility with the emerging cartographic standards being promulgated at the national and international levels. Finally it provided feature data in a form familiar to some of the respondents to the questionnaire. Since the cartographic producers and the facility data suppliers, generally, from intelligence sources, often represent information differently, added questions were necessary to address the needs of the operational user who relies on both information origins.

It became apparent that the current and emerging cartographic feature identification conventions do not accommodate a number of needs of operational and planning users accustomed to using intelligence community-produced data. The responses in this section indicate that the cartographic feature representation is confusing to many respondents since it does not systematize features which they normally use in a functionally associated way. However, since the intelligence organizations have not developed a robust information accounting system for sub-installation or facility data, the existing or emerging cartographic renditions must suffice by default.

There were occasions that neither the cartographic nor intelligence systems provided spatial documentation techniques for unique types of information, such as underground facility data, buried features, object data, interior spatial data, and time related events. Nevertheless these unique sets were added to the questionnaire as additional data types to be assessed in the context of high definition data. The positive responses received confirm this decision.

Twelve classes of feature types were included in the questionnaire. They are the following:

Installation/Facility Features
Building Features
Transportation Features
Utility Features
Communications Features
Storage Features
Vegetation
Open Space
Topography
Hydrography
Structures
Military Defenses

The first two feature types included a limited number of descriptive attributes to illustrate the type of information that could be part of a high definition data set. The remainder of the feature classes listed feature types only. Generally, these were first order systems (eg., electric power) rather than the individual functional facilities that would comprise one of these systems. In this questionnaire, the objective was to ascertain data needs to the primary system level. A full rendering of data requirements would necessitate the inclusion of full functional facilities for each system as well as detailed attribute level data for the features. This was not feasible in this type of general requirements survey. This should have been better documented in the questionnaire since it led to a number of respondents adding feature and attribute data that would normally be in a high definition set, but were below the first order listing in the questionnaire.

Questionnaire Findings

Section Two of the questionnaire contained 18 queries. To illustrate the feature types included, they are listed in the question statement as they were in the questionnaire.

These were the instructions for the feature section of Part II of the questionnaire
This section addresses the types of information that might be useful for the various developmental, operational and training activities in a HIRUS data set. The specific data examples are of the level of detail that might be represented at a nominal 1:5,000 scale.

Please circle each type of information desired for your applications in a high resolution data base such as HIRUS.

Question Statement

II-1. INSTALLATIONS/FACILITY FEATURES

a. Functional Types
   Basic, primary and secondary industry
   Transportation
   Commercial
   Governmental
   Educational, religious & medical
   Military Facilities
b. Status
c. Other _____

Background to question

The first feature type represents a combination of both cartographic and intelligence identification schemes. Emerging cartographic conventions for digital data management appear to disaggregate functional entities (eg., a steel mill) into the significant component parts that are generally observable from the air or sea or affect safety of navigation. For example, a blast furnace might be a feature due to its large size, observability and height. However, it is not clear how this feature would be associated with its parent facility - the steel mill. In the case of airfields, there is a dual mode of "mega-features" comprised of a number of individual features, all appropriately attributed and the individual features themselves associated with the master feature. Since the system of cartographic features was originally developed to support

digital mapping as a mirror image of manual mapping conventions, the rules of application for other purposes have not yet been codified.

Traditional intelligence renditions of facilities have maintained most spatial activities at their functional descriptive level (installation or facility) with elements being restricted to a limited number of discrete functional descriptions or collocated activities directly supporting the main facility. For example, a power plant installation might have spatially described entities for the main generation building and the transformer yards. Rarely are these descriptions documented spatially except on a hard copy product concerning the facility. The remaining data would generally be in textual or annotated image format. Thus *there is significant, but very much doable, work to be done to draw the cartographic and intelligence conventions into a compatible and workable schema. This may be the major challenge in the production of a high resolution data set*

In a broader context, activities in urban areas are often aggregated into a larger functional classifications such as "industrial", "commercial" or "military" or, in the case of Field Manual 90-10 by their "construction and physical layout". These "area" classifications must also be addressed in a high definition system. This first question is a hybrid that addresses some of these requirements.

Responses

Ninety percent (46) of the respondents indicated they needed installation and facility data that includes functional typing by activity. Data exists within intelligence classification systems to provide such typing of facilities, although it has not been represented spatially in an automated way. Limited non-digital cartographic representations of installation/facility data exist in the Series 200 Air Target Chart, and Special Intelligence Graphics (SIG). City Graphics, the only large scale product with these data, often delineate spatial boundaries of facilities. To a limited degree in the digital realm, Digital Feature Analysis Data at 1:250,000 scale and to a limited degree at 1:50,000 scale identify functional types but without facility data. Forty three percent (22) indicated the desire for facility status. This term was not further defined in the questionnaire; nevertheless a substantial number of respondents indicated it was a desirable attribute. The additional requirements

were:.vegetation (not an installation/facility and listed in question II-7); Communications Facilities (listed in Question II-5); Condition of the building (amount of damage that would affect line of sight), more appropriately addressed in question II-2, and "Text toggle to obtain B. E. Number" (one of the intelligence installation record identifiers).

Comments/Observations

The responses are one of several in the questionnaire that confirm the need for installation/facility data represented spatially in a digital format. This will require the meshing of data from both the cartographic and intelligence activities. The real issue is not whether the information is available but the conventions, techniques, and interagency cooperation necessary to blend it into a high definition data set.

Question Statement

II-2. BUILDING FEATURES

a. Uses
Industrial
Commercial
Governmental
Educational
Religious
Military/National Security
Medical
Residential
b. Density
c. Construction type
d. Size
e. Height
f. Landmark Buildings
g. Status
Under Construction
Occupied
Unoccupied
Abandoned
Damaged
Destroyed
h.Other _____

Background to question

Building features represent a detailed method to represent the previously discussed installation and facility data. This feature is

an essential descriptor for a high resolution data set. In a large installation there would be many building features each requiring its own set of attributes and related to the larger functional entity. In urban areas, a major building might be a discrete feature and its attributes would adequately describe the entire entity. Seven attributes were provided to show the types of information normally associated with buildings.

Responses

One third of the respondents (17) wanted the entire data set. Two respondents desired additional data, including location of a specific building (an attribute), and wires/antennas/towers, etc. associated with the building.

Comments/Observations

Although a third wanted the entire data set, much higher responses were registered across the board with use, size and height predominating - approximately eighty percent (40-42) wanted these attributes. Status, Construction Type and Landmark Building responses clustered at sixty-five percent with Building Density at fifty-seven percent. Such high percentages confirm these as important attributes of building data.

Question Statement

II-3. TRANSPORTATION FEATURES

a. Roads & Streets
b. Railroads & Light Rail
c. Waterways & Inland Ports
d. Ports & Harbors
e. Airports
f. Landing Fields
g. Heliports
h. Trails and Tracks/FootPaths
i. Fords
j. Ferries
k. Oil & Gas Transmission Pipelines
l. Other _____

Background to question

Transportation features represent a major need for spatial representation as they show the routes traveled by people and goods

in peacetime and military movement in conflict. These features represent many of the types of transportation routes and nodes displayed on cartographic products.

Responses

Eleven general feature types were listed. Two thirds of the respondents wanted the full data set with the remaining third being selective in their responses. One respondent noted "all should contain sub-categories with further attribution (e.g. single track RR)". Such would be the case in a full data set. This was a major complaint throughout this section of the questionnaire.

Comments/Observations

Major transportation nodes were generally required with lesser features such as track/trails, fords & ferries the least desired. Unquestionably a robust transportation feature set would be essential for a high resolution data base.

Question Statement

II-4. UTILITIES FEATURES

a. Electric Power Systems
b. Potable Water Systems
c. Sanitary Sewer Systems
d. Solid Waste Systems
e. Natural Gas Distribution
f. Heating Distribution
g. Other _____

Background to question

Most focus on utility systems single out electric power and ignore the other essential services important in an urban environment. Although the loss of electric power may produce the most immediate effects to a modern society, the long term lack of potable water, heating and sanitation may be more debilitating. In an urban context, these systems often are a web of interdependancies.

Responses

This question focuses on the system level only. Six major utility systems were included plus an "other" category. There were several non-responses to this question.

Comments/Observations

Thirty-five percent of the respondents (18) wanted the entire data set. Eighty-five percent (44) wanted electric power, the most popular request. Sixty-five percent (34) indicated the need for potable water system. The other utilities grouped around 40 percent. Since many utilities in urban areas are underground, often the desire to know their location is for the access tunnels rather than the systems themselves. As the recent floods in Chicago showed, many cities have a labyrinth of underground passages that could be useful for more than utility purposes.

Question Statement

II-5. COMMUNICATIONS FEATURES

a. Telephone transmission (long lines)
b. Telephone Exchanges/Switching & Control Centers
c. Microwave Transmission
d. Satellite Communication
e. Broadcast Stations (Radio & TV)
f. Radio - cellular phone
g. Commercial Radio
h. Other _____

Background to question

Communications represents another vital network in an urban environment. The questionnaire features focus on telephone and radio communication. Again, these features are at the generic system level, not the actual facility level.

Responses

Seven types of communications were listed, plus "Other". There were several non-responses to this question. Added features included towers/antenna, underground cables, law enforcement communications, towers causing frequency interference, and satellite dish domes.

Comments/Observations

Fifty-two percent (27) wanted the entire data set. Telephone Transmission and Microwave Transmission clustered at 80 percent

with Telephone Exchanges and Satellite Communication clustered around 75 percent. A third cluster occurred at 60 percent. There is high interest in these features for a high resolution data set.

Question Statement

II-6. STORAGE FEATURES

a. Motor Fuels (gasoline, diesel)
b. Industrial Fuels
c. Chemicals
d. Dry Storage
e. Open (coal, gravel, sand, raw materials)
f. Other _____

Background to question

Storage is a broad feature classification covering a number of diverse types of storage from motor fuels (included) to aviation fuels (not included), through various dry commodity storage, to wet storage of a wide variety of products and open storage. Generally, storage is considered an area feature but often it is represented by finite structures such as buildings or tanks. Usually, it is not the storage itself, but the commodity stored that is important to the user of the data set. It would be important in a high resolution data set to have the proper attribution for the stored commodity, as well as the storage medium.

Responses

For the purposes of the questionnaire, only five feature categories were listed including selected fuels, chemical, dry and open storage. As expected, the respondents added many storage feature types or commodities. These included AVGAS, Weapons/Ammo/NBC, Water, Aircraft fuels, Grain storage silos and nuclear fuels. This confirms what was said in the background segment about commodities.

Comments/Observations

Forty-six percent (24) of the respondents wanted the full data set. Motor fuels was the most identified single feature at eighty-one percent (42). This was followed by Industrial Fuels and Chemicals at sixty three percent (33). and Dry and Open Storage at fifty two percent (27/26).

This is the last of the cultural built-up features, excluding structures and military facilities. The next four feature types will focus on physical or natural features.

Question Statement

II-7. VEGETATION

a. Woodland & Forest
b. Orchard & Vineyard
c. Marsh
d. Swamp
e. Hedgerow
f. Grassland
g. Agriculture
h. Arid/Desert
i. Other _____

Background to question

Vegetation is a major natural feature classification of military interest. It is important to mobility, fields of fire, cover and concealment and line of sight. It was one of the earliest applications of DTD. The vegetation features included are the typical cartographic land use categories based upon types of growing things. The emerging digital classification systems have numerous feature/attribute sets to describe the characteristics of these and other vegetation types.

Responses

Seven major vegetation feature types were included plus hedgerows since they are major impediments to most cross country movement. Virtually all respondents provided inputs. Additional types indicated under the "Other" category. were salt flats, jungle, open canopy and seasonal variations in vegetation.

Comments/Observations

Sixty-nine percent (36) of the respondents wanted full data sets. The types that would most affect mobility (woodland/forest, swamps, marshes and desert) all garnered over 90 percent. All others were above 75 percent indicating this is a "must" class for high resolution data.

Question Statement

II-8. OPEN SPACE

a. Parkland
b. Unused land
c. Cemetery
d. Agriculture
e. Sand Dunes
f. Distorted Areas (lava, sand, strip mines)
g. Vehicular parking areas
h. Other _____

Background to question

Open space is an amalgam of various types of features that would "fill in" the landscape with features in addition to vegetation. Many are closely related to the vegetation class. Agriculture is listed in both classes and sand dunes found in this class would directly relate to the arid/desert feature of the vegetation classification. Vehicular parking, cemeteries, and possibly parkland are man-made features. The purpose of these features is to provide sufficient classifications to accurately identify areas that may affect military applications.

Responses

There are seven feature types in the question plus "Other". Most responses were multiple answers although there were some single answers.

Comments/Observations

Responses fell into two groups. The high group clustered around 76 percent and included Distorted Areas, Sand Dunes, Agriculture and Vehicular Parking. The low group are about 64 percent included the other named features. This appears to be a high interest area for a proposed data base. The two additional features from the "Other" category were Lakes/Ponds (see II-10) and clear cut.

Question Statement

II-9. TOPOGRAPHY

a. Contours
b. Slope
c. Elevations
d. Mines, Adits, Shafts & Caves
e. Quarry & Gravel Pits
f. Craters
g. Cliffs
h. Barricades & Berms
i Cuts & fills
j. Other _____

Background to question

Like vegetation, topographic applications have been a substantial use of DTD, particularly to address mobility and line of sight. This class of features seems to be a potpourri of differing types of features.

Responses

The nine types of topography in the question include physical data such as contours, slope and elevation and also include man-made features such as mines, adits and caves; quarries; and barricades and berms. There are robust surface features (contours, slope and elevation) wherein there is a lot of information and the underground features where there is not even a good system for elementary bookkeeping. These feature types received major attention by the respondents.

Comments/Observations

Fifty-eight percent (30) of the respondents wanted the entire data set. The responses grouped into three groups. The top group contained the traditional cartographic elements, contour, slope and elevation in the mid-90 percentages with *elevation commanding a near total response*. The second group focused on mobility features such as cliffs, barricades and cut & fills. These had a 90 percent response. The third group centered around 75 percent and included the underground features and various holes in the earth. The additional items included wadis or dry creeks and soil types.

Topographic features continue to command great importance across the span of military activities. Existing DTD may be the most robust in this classification, and although it is currently lacking in high definition, much data could be mapped into this resolution electronically from lower resolution data.

Question Statement

II-10. HYDROGRAPHY

a. Streams
b. Ponds
c. Lakes
d. Natural Drainage
e Manmade Drainage (eg. storm drains)
f. Falls & Rapids
g. Springs & waterholes
h. Wells & Cisterns
i. Irrigation canals
j. Aqueducts
k. Flood control systems/canals
l. Other _____

Background to question

Hydrography rounds out the quartet of "physical" features. It too has been a traditional focus of DTD. This question took a limited view of hydrography, focusing primarily on inland water features, natural and man-made. It does not address open ocean or major shoreline features. While this assessment may be satisfactory for many Army applications it would not suffice for total DoD user applications. The Navy SEAL response indicated this to be a shortfall where foreshore and offshore features were not included.

Responses

Eleven features were included in the query, plus "Other". All features resulted in high response rates. Additional features suggested included underwater relief/fixtures, reservoirs, snow & ice cover and rivers (this being under natural drainage).

Comments/Observations

Fifty-two percent (27) of the respondents wanted the entire data set. All individual responses were in the high percentages. The lowest, Wells and Cisterns, still accrued a respectable 75 percent, with the three top responses Steams, Ponds and Lakes in the 90 percent range.

This completes the four primarily "natural" feature classes. The two following classes are a miscellaneous structures class and military activities.

Question Statement

II-11. STRUCTURES

a. Dams & locks
b. Overpasses & Underpasses
c. Bridges
d. Tunnels
e. Culverts
f. Racetracks
g. Amusement Parks
h. Monuments
i. Chimneys
j. Silos
k. Lighthouses
l. Towers
m. Walls
n. Fences
o. Oilwells
p. Other _____

Background to question

This is primarily a cartographic classification of significant features suitable for annotation on charts. Generally, they are large structures that can been seen from the air or the sea. Although some of these structures may be isolated, they often are associated with other features such as buildings, or are part of larger installations or facilities. For example, bridges, tunnels and culverts are normally associated with lines of communication (roads and railroads), whereas chimneys usually are associated with heat-producing industries or electric power generation. In a high definition data set, the proper association of these feature types with their primary feature would be essential rather than displaying them as independent stand-alone features. This feature relational issue would require major refinements for a high definition data set.

Responses

Fifteen miscellaneous features were included plus "Other". The "other" responses included wires/antennas (associated with the structures).

Throughout this section the issue of wires, antennas and towers kept coming up as obstructions, communications means, or frequency emitters that could disrupt weapons systems. This substantially expands the potential attributes that would be associated with these features into areas not commonly considered to be cartographically significant.

Comments/Observations

Forty-six percent (24) respondents wanted the entire data set. The responses fell into four ranges. The top group was associated with overland movement (bridges, over and underpasses, and tunnels) and had a 94 plus percent response rate. The second, and largest number, group centered at 80 percent, the third group and smallest number, were at 70 percent and the lowest group was in the 50 plus percent range.

Question Statement

II-12. MILITARY DEFENSES
- a. Forts & Strongpoints
- b. Pillboxes & fighting positions
- c. Anti-tank barriers
- d. Minefields
- e. Gun emplacements
- f. Missile Sites
- g. Radar Facilities
- h. Other _____

Background to question

The military defenses classification is another potpourri of cartographic features that focus on ground combat and may be observable from the air or sea. This is an additional area that may need significant enhancement if a high resolution data set is created to include those features important to a wide range of military activities.

Responses

Seven features were included, plus "Other". Other additions included passive detection facilities, storage facilities (see II-6), and nuclear, biological and chemical (NBC) weapons sites.

Comments/Observations

All military features are high on the respondent's "want" list. Seventy-nine percent (41) respondents wanted the entire list. This is the highest response for the total list of any classification in the questionnaire. No single feature fell under 82 percent.

This is the last of the feature classification types. The next five questions in part two address data fidelity and specialized data needs.

Question Statement

This sub-section addresses the levels of detailed information desired concerning the above types of activities or features.

II-13. What level of detail would you require to describe and use cultural features? If multiple levels needed for different tasks please indicate all levels of detail needed.

a. Areas of activities identified by coarse physical layout or construction type descriptors of the FM 90-10 MOUT variety (eg. dense random: construction, industrial/transportation, dispersed residential, closely ordered block, high rise)

b. Activity areas identified by coarse functional activity (eg. commercial, industrial, utilities, governmental, educational, medical, military)

c. Activity areas identified where possible to the feature level (eg. Tysons Fuel Depot, Tysons Hospital Center, Tysons Communications Center, McLean Campus - SAIC, Tysons Power Generation Plant)

d. Features identified to their functional subelement level (eg. Tysons Communication Center Microwave Tower, Tysons Communications Center Control Building; Tysons Fuel Depot Tank Farm, Tysons Fuel Depot Fuel Distribution Point, Tysons Fuel Depot Pipeline Terminus; Tysons Power Generation Plant Boiler House and Generator Hall, Tysons Generation Plant Transformer Yard and Switching Station.)

e. Same as d. but further identified and described (attributed) to the building level as required. (eg. Tysons Fuel Depot Pipeline Terminus Compressor Building, Tysons Generation Plant Cooling Water Intake Building)

f. Same as d. & e. above but to an object level (visible or invisible) (eg. Tysons Generation Plant Transformer No 1. 1200KVA; Tysons Communications Center Fuel Tank 5000 gal)

g. More detailed data to include interior layouts of building, etc.

h. Other _____

Background to question

A very important aspect of a high definition data set is the level of fidelity the information format is expected to have. It is not enough to specify a desired scale, and what features would be desired. It is essential in a high definition data set to clearly specify how much detail will be provided for the user in that scale. This question addresses that issue. It provides a range of increasing detail from physical layout and functional descriptors through installation level data to installation sub-element data and ending at object level data, within or without enclosures such as buildings. Depending upon the application each detail level has potential for use. This is a milestone question in that it attempts to quantify the need for these differing fidelity levels.

Responses

This is a multi response question with seven levels of detail. 140 separate responses were recorded from the 52 respondents.

Comments/Observations

Only four percent (2) of the 52 respondents indicated they wanted the entire span of detail. However, sixty-seven percent of the respondents indicated they wanted multiple levels of detail. Thirty-three percent of the respondents (17) indicated only one level of detail with only 15 percent (8) of the respondent's wanting these data restricted to just physical or functional layout generalities.

Of the 123 multiple responses, *ninety-six percent (117) wanted multiple levels of detail that included installation/facility level or better data*. Twelve percent (15) wanted sub-installation data included, fourteen percent (17) wanted building level data included, nine percent wanted object level data included and fourteen percent (17) wanted interior details in their data set.

This is a significant definition of user preferences. Most want at least installation data or better representations. This underscores why the cartographic and intelligence organizations must agree upon a compatible data exchange structure and standard for detailed data.

Question Statement

II-14. Of the detailed levels outlined above, which would be most used and which would be least used for your applications? (multiple answers OK)

Most Used Least Used

Background to question

The "level of detail" issue cuts across many aspects of high definition data from data architecture and standards, through production, to data storage and display. This question addresses the anticipated use of the various data fidelity types as they relate to the user's applications. It is an attempt to further refine the previous question.

Responses

The question asked for the most used and the least used fidelity types as they relate to user applications.

Comments/Observations

The objective of the question to better clarify the needed information did not succeed. Although the findings somewhat correlate with the previous question, it did not better focus on the real data fidelity requirements.

Forty-four percent (47) indicated the general data levels (physical or functional layouts) would be the most used compared to 38 percent in the previous question. Fifty six percent (59) indicated they would most use installation level data or more detailed data compared with 62 percent in question II-13. These were the correlations.

The findings on the least used data do not track with the findings from question II-13. The responses indicate the "least used" data was lowest in the generalized categories and highest in the more detailed areas. The data does not permit the resolution of this difference. This should be further researched.

Question Statement

II-15. Would your applications require data base accounting for time related events such as a meeting to be held or was held at a particular place on a particular date and time?

Background to question

One of the strengths of a spatial data base is to be able to "see" time related events as they are occurring (an aircraft flight) or to document a region of similar events spatially. Often the attempt to do event plotting on less detailed spatial backdrops results in blobs of information rather than useful information. A high definition data base could alleviate this extant shortfall. The context of this question was less from the realtime perspective than from the ability to document reasonably fixed activities (although it certainly could be used for realtime activities if required). Since time event reporting focuses more on the operational world, many of the current questionnaire respondents may not require these data to support their developmental or simulation activities.

Responses

The question was a yes/no type with "possible" and "don't know" answers added.

Comments/Observations

Forty-four percent (23) of the respondents indicated no need for time related even data, twice as many as the positive respondents (11). However, 27 percent (14) indicated a possible need and 8 percent (4) did not know. (See a different viewpoint in questions III-12 through III-13 in section III which suggests there may be more interest than recorded here.)

Question Statement

II-16. Would your applications require data base accounting for spatial entities such as rooms, equipment, etc. including structures that are not visible to imagery sources?

Background to question

Inherent in the high end of the data detail spectrum outlined in question II-13 is how objects or building interiors will be accommodated in a high definition data base. For some applications, such as hostage rescue, knowledge of virtually every aspect of the surrounding physical environment would be important. Similarly, the target scene requirements for modern precise weapons will require significantly more detailed data, including interior data for vulnerability assessments. This is a special category of data, but

one which may be vital to the success of a particular mission or weapons system.

Responses

The response set is similar to the previous question. An additional answer of "spatial but not description" was added. One respondent did not answer this question. There were no responses for spatial data without description.

Comments/Observations

There was a three way split between the yes, no, and possible. The "no" was 34 percent (17), the "yes" at 32 percent (16) and "possible" at 28 percent (14) with a small (4) "don't know" response. The yes response is larger than the question II-13 response when 20 percent indicated they wanted these data. Both of these questions confirm the existence of applications and users that require highly detailed interior information. A challenge will be to develop a workable system for this spectrum of information.

Question Statement

II-17. Would your applications require data base accounting of large underground facilities such as mines, bunkers, storage areas, etc?

Background to question

A data type that is not well documented, particularly in the spatial realm, by either the cartographic or intelligence activities, is large underground facilities. These could be mines; underground storage areas, natural or manmade; caves; or large buried facilities. They have spatial form but are hidden from surface view. Appropriate feature and attribution conventions need to be developed and adopted to accommodate these data types. This question addressed the need for such data.

Responses

The query is essentially the same as the previous question. There were 51 responses with one respondent not answering.

Comments/Observations

Fifty-six percent (29) of the respondents indicated a need for this type of spatial data with only 8 percent (4) to the negative. Thirty-

three percent (17) indicated a possible need. One indicated a need for the spatial data but no descriptions. It is clear that planning for this feature type would be appropriate.

Question Statement

II-18. Would your applications require data base accounting for near ground level buried activities (eg. utilities, refuse lines, storm drains, pipelines, minefields)?

Background to question

This is the last question in part two. It addresses the need for near ground level buried features. These are a diverse class of information whose primary criterion is that they are located in a near underground spatial realm and are probably man-placed rather than occurring natural. They could be as diverse as utility lines, refuse (sewer or storm drain) lines, petroleum pipelines, or even minefields.

Responses

The format is the same as the previous several questions

Comments/Observations

A large portion of the respondents, 69 percent (36) want buried feature data, compared to only 1 negative comment. Twenty-seven percent (14) indicated a possible need for the data. One respondent did not know. No respondent indicated a need for spatial data without description.

Section III

REQUIREMENTS FOR HIRUS DATA MAIPULATION

Introduction

This section of the questionnaire addresses the requirements for data manipulation that users would require with a high definition data set. Since this section addresses many different types of information, the entire question as stated in the questionnaire is provided.

The inclusion of a section on data manipulation does not presume the ultimate format of a high resolution data set should the decision be made to create it. However, it is important to determine the types of capabilities a potential user group would expect when using a high definition set of information since it has implications for the types of information in the data set and certainly its organization and functionality. One respondent commented "Get the data into a standard format, Let someone else develop the software." Standard exchange formats are essential in today's multi-user environment. However, the issue here is not who prepares the software but what the software should be able to do with the data to assist the users in their applications and tasks. Prior planning should preclude having good data but being unable to use it in an efficient and expeditious manner. This section focuses on the use of the data and desirable graphical user interface features, all elements in data manipulation.

Questionnaire Findings

Question Statement

III-1. How might you use HIRUS data?

a. Would use HIRUS as a stand-alone application
b. Would use HIRUS in concert with other DTD if possible
c. Would use HIRUS as a data set input to other applications
d. No Preference
e. Don't know
f. Other _____

Background to question

This question asks how the respondents might use a HIRUS data set in the context of their operations.

Responses

It is a multiple response question that had seventy five responses from the 52 respondents.

Comments/Observations

Forty-eight percent (48) of the total responses desired to use the data set as an input to other applications. In terms of single responses, thirty-eight percent (20) of the 52 respondents would use it as an input to other application programs. Seventeen percent (9) of the total responses would consider a stand alone application but only one respondent of the 52 indicated this as their sole use. Four percent (3) did not know how they would use it. Thirty-five percent (35) indicated they would use it in conjunction with other DTD. It is safe to say that the respondents would consider HIRUS more of a data input than an independent application.

Question Statement

III-2. How would you want to be able to query the data set initially?

a. Coordinate entry
b. Point and click on an overall display map
c. Rubber box outline of desired area on overall display map
d. Name entry of glossary entry
e. Select from pull-down menu
f. All of the above
g. Other _____

Background to question

As the question states, this is to solicit desires on how users would want to initially enter the data set.

Responses

This is a multiple answer question. There was one questionnaire with no response. The following table indicates the total responses (95) in rank order.

HOW WOULD YOU WANT YOUR INITIAL QUERY
Ques III-2

52 RESPONDENTS

KEY	RESPONSE	#
F	ALL OF THE ABOVE	31
B	POINT&CLICK	17
E	PULL DOWN MENU	15
A	COORDINATE ENTRY	12
C	RUBBER BOX	10
D	GLOSSARY NAME	9
G	OTHER	3

Table 15

Comments/Observations

The responses show that the potential users want multiple ways to enter the data set since sixty percent (31) desired full query functionality as their only choice. Only eight percent (4) of the respondents indicated they wanted a single entry method. In addition to those listed, pan & zoom, and a combination of A&C were suggested. One respondent said "all of the above (allow for user definable default)".

Question Statement

III-3. From the list in III-2 above, prioritize your preferred method(s) of HIRUS entry.

Background to question

This question attempts to further refine the previous question.

Responses

Figure 7 illustrates graphically the priorities.

Comments/Observations

The overwhelming choice was for all of the capabilities, followed by point and click.

INITIAL QUERY
Ques III-2&3

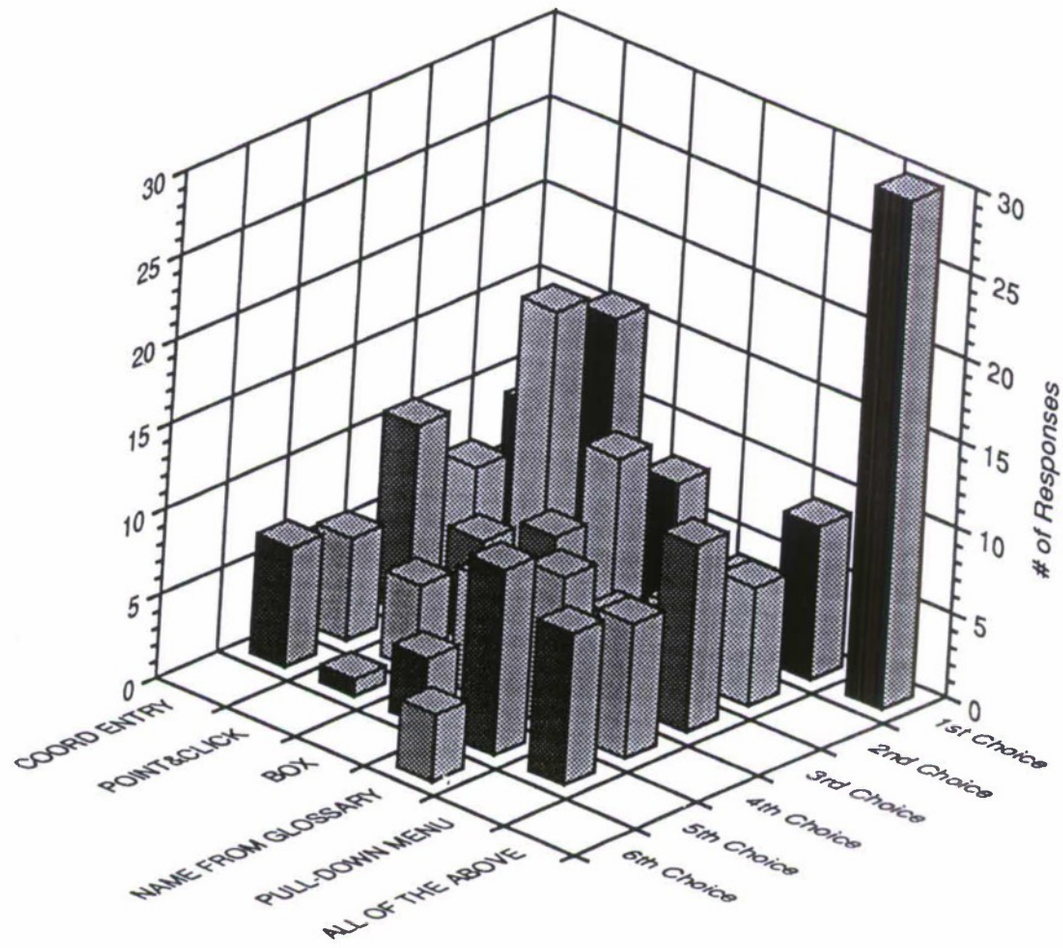


Figure 7

Question Statement

III-4. At what information level would you want to enter the data sets?

a. Region, Area (eg. country, state, etc); 1:250000 scale
b. General Area; 1:50000 scale
c. City Level (user specified); 1:12500 scale
d. Detail level; 1:5000 scale
e. All of the above
f. Don't know
g. No preference
h. Other _____

Background to question

A major consideration in entering the data is at what level of detail does one want to enter. This question addresses this issue.

Responses

A number of scale choices were provided from 1:250,000 to 1:5,000 with other choices. This is a multi-response question. Seventy-seven total responses were received.

Comments/Observations

The largest response was for data set entry at all scales. Fifty-two percent (27) of the 52 respondents indicated this was most desired, followed by fifteen percent (8) desiring the range between 1:50,000 and 1:5,000. One respondent provided useful insight that this would be "dependent on storage medium and method of entry, if coord entry - detail level, if point and click or rubber box - general to city level." Such comments further underscore why Section Three was included in the questionnaire.

Question Statement

III-5. What data do you first want to be displayed?

a. Data level corresponding to entry query
b. Always overview map
c. User selectable from menu
d. Don't know
e. No preference
f. Other _____

Background to question

This is another functionality issue; what data should be first displayed.

Responses

This is a multi-response question.

Comments/Observations

Again, the responses were clear for full functionality. Although this was a multi-response question, 82 percent (43) of the 52 respondents answered it with a single response. Forty-eight percent of the 52 (25) indicated they only wanted user-selectable entry, followed by twenty-three percent (12) desiring only entry from an overview map. Again, a default menu of choices with the user defining the defaults were mentioned in several comments.

Question Statement

III-6. How do you want data to be displayed?

a. HIRUS data overlay on map background
b. Data on no geographic map background but spatially correct
c. User selectable from menu
d. Don't know
e. No preference
f. Other _____

Background to question

Functionality investigation continues as to how data may be displayed.

Responses

This is a multi-response question.

Comments/Observations

Full functionality continues. Most respondents treated this as a single response question. Sixty percent (31) of the 52 respondents wanted only a user selectable data display followed by seventeen percent desiring HIRUS on a map background only. Again, user defined defaults requested.

Question Statement

III-7. How do you want the data organized for display?

a. User selectable types or classes from menu
b. All data of similar functional type (eg. all POL facilities)
c. All data of a general class (eg.all transportation)
d. All data within an specified area
e. Data that corresponds to a query (eg. all buildings over 6 floors)
f. Data corresponding to a level of data detail (all installations)
g. Don't know
h. No preference
i. Other _____

Background to question

Functionality continued; how data organized for display..

Responses

This is a multi-response question.

Comments/Observations

Two of the 52 respondents wanted full functionality outlined in a.-f. above. Forty-four percent of the 52 respondents (23) chose menu selected organization as their only preference followed by data query.

Question Statement

III-8. Do you want an orientation box of an overview map background displayed when viewing the detailed level of display?

a. Yes
b. No
c. No preference

Background to question

Often when working with highly detailed data, disorientation occurs as to where a feature is from a broader perspective. One method to maintain orientation is to use a small scale orientation box. This question addresses this issue.

Responses

This was a yes/no/no preference question

Comments/Observations

Sixty-seven percent (35) of the respondents desired an orientation box with twenty-three percent (12) indicating no preference. Only four indicated they did not desire this capability. Only one person did not respond

Question Statement

III-9. How do you require decluttering or augmenting of data?

a. overlay
b. features
c. symbols
d. areas
e. scales
f. combinations of the above
g. Other _____

Background to question

A major concern using digital data on a computer terminal is how to manage the amount of information that is displayed on the screen both in adding data (augmenting) and eliminating data (decluttering).

Responses

This is a multi-response question. Sixty-seven total responses were logged from the 52 respondents.

Comments/Observations

Sixty-one percent (41) of the total responses indicated the users wanted combinations of methods to augment or declutter followed by 16 percent (11) indicating overlays were desired.

Question Statement

III-10. Do you want the capability to add features (eg. new obstructions) or feature characteristics (eg. threat zones) to the data set?

a. Yes
b. No
c. Don't know

Background to question

The thrust of this question is distributed maintenance of the data set. The issue is whether the users should have the capability to modify the basic data set with information of particular utility to their needs. This underscores the need for standards to guide non-production center updating of the files.

Responses

This is a yes/no/don't know question.

Comments/Observations

Ninety-two percent (48) of the respondents indicated they wanted the capability to update the data set. The remaining respondents indicated they did not know. There were no negative responses. *It is clear that the potential user community of a high definition data set want an update capability to be done by the user.*

Question Statement

III-11. Would you like certain features displayed as symbols or icons using cartographic or military symbology? (eg. towers, chimneys, powerline traces)

a. Yes
b. No
c. Don't know

Background to question

A popular means of spatially identifying data on cartographic products is through the use of visually descriptive symbology. This question carries this concept into the spatial data base realm and asks whether users would like some data to be represented in a visual manner by symbols or icons.

Responses

This is a yes/no/don't know question.

Comments/Observations

Eighty-eight percent (46) of the respondents liked the symbology/icon proposal. This is ten times the negative response of 8 percent (4). Two respondents did not know. *The users are obviously comfortable with the use of visually descriptive symbology in a high definition data environment.*

Question Statement

III-12. Do you want a capability to display "non-HIRUS data" such as enemy order of battle or friendly unit positions with HIRUS data?

a. Yes
b. No
c. Don't know

Background to question

One of the benefits of a computer-based spatial display is the ability to overlay non-data base information on it to take advantage of the spatial background's relationship with the displayed activity. The traditional method of doing these displays in a manual way was to prepare acetate overlays to maps. This question is, in essence, "do you want an overlay capability for HIRUS?"

Responses

This is a yes/no/don't know question.

Comments/Observations

Ninety percent (47) percent of the respondents indicated they wanted the non-data set information overlay capability. The remaining respondents did not know.

Question Statement

III-13. Would you want to maintain and display a track history of a movable object (eg. friendly unit) on HIRUS data?

a. Yes
b. No
c. Don't know

Background to question

Very much related to the ability of overlaying non-data set information on the high resolution spatial background is the ability to track movement of an activity through it. Optimally this would be drawing data from a "real-time" data feed providing locational updates of events as they are occurring, but could very well be updating time delayed or historical movement data.

Responses

This is a yes/no/don't know question.

Comments/Observations

Eighty-three percent (43) of the respondents indicated they wanted track history capability, over ten times the negative response. Five respondents did not know.

Question Statement

III-14. Do you require a position query capability?

a. Yes
b. No
c. Don't know

Background to question

A major question posed to spatial data in either the manual mode (maps) or automated mode (computer display) is "where is that located?" Although many automated programs have positional query capabilities, this question reaffirms this need in relation to high definition data.

Responses

This is a yes/no/don't know question.

Comments/Observations

Ninety percent (47) of the respondents affirm they want a positional query capability. Only 2 respondents indicated they did not and three did not know.

Question Statement

III-15. If you want a position query how do you want the answer displayed?

a. Latitude & longitude
b. Geodetic coordinates
c. MGRS/UTM
d. All of the above on a selectable basis

Background to question

This question continues the positional query investigation by determining what coordinate systems would be desired by the positional system.

Responses

Three major systems were provided plus an all-of-the-above response in a multi-response question.

Comments/Observations

Eighty-one percent (42) desired the full coordinate capability.

Question Statement

III-16. Do you want a coordinate conversion capability?

a. Geographic to UTM
b. UTM to geographic
c. Both
d. Both plus _____
e. Don't need coordinate conversion

Background to question

This question addresses the need for a conversion capability among coordinate systems.

Responses

This is a multi-response question.

Comments/Observations

The question was answered very much as a single response question. The bulk of the responses indicated *a full coordinate conversion capability was desirable.* Additional conversions were requested. GEOREF and MGRS were requested. In addition, several respondents indicated particular projections desired, including WGS 84, Polar, and Lambert. Also, datum transformations were requested. One comment was interesting; it was, "Don't want coordinate conversion - too much error associated with conversion." This may have been a credible observation in the past when there were a number of "unofficial, working" conversion routines. However,a draft Military Standard now exists to provide a "standard" way of doing coordinate conversions, and alleviate error problems.

Question Statement

III-17. Do you require general measurement capabilities (not precise mensuration)? (multiple answers OK)

a. Elevation query
b. Bearing query (true and magnetic headings)
c. Distance query (straight line point to point Line of Sight)
d. Distance query (multiple point ground route)
e. Don't need measurement capabilities

Background to question

Another functionality often found in automated spatial display systems is a measurement capability. Although HIRUS is envisioned to be a "high resolution" data set, it does not imply that one can derive highly accurate mensurated coordinates from any location in it. However, the accuracy of HIRUS data should permit derivation of credible distance and bearings satisfactory for most applications.

Responses

A number of measure queries were provided in this multi-response question.

Comments/Observations

Fifty-eight percent (30) of the 52 respondents indicated they wanted the full set of measurement capabilities. This was ten times the number of respondents that indicated they did not need measurement capabilities. In terms of individual responses,

elevation garnered the most responses with 45, followed by line-of-sight distance with 40, ground route distance with 38, and bearing with 37. This cluster of responses confirms a substantial need for these capabilities by their potential users.

Question Statement

III-18. If measurement is desirable, what units are needed? (multiple answers OK)

a. Meters
b. Kilometers
c. Feet
d. Statute miles
e. Nautical miles
f. Degrees
g. Other _____

Background to question

One cannot consider measurement capabilities without addressing measurement units.

Responses

Six popular measurement units were included in this multi-response question. The following table shows the findings in rank order.

WHAT MEASUREMENT UNITS ARE NEEDED
Ques III-18

52 RESPONDENTS

KEY	RESPONSE	#
A	METERS	45
B	KILOMETERS	37
F	DEGREES	27
D	STATUTE MILES	20
C	FEET	19
E	NAUTICAL MILES	19
G	OTHER	4

Table 16

Comments/Observations

Although the responses indicate a trend toward metrification, there remains a substantial need for other types of measurement units. Additional responses under the "Other" category were square kilometers, metric units, radians and a "default option".

Question Statement

III-19. Do you require the following? (multiple answers OK)

a. Hill and relief shading (with selectable light source azimuth and inclination)
b. Hypsometry (constant elevation)
c. Terrain masking
d. Terrain profiling

Background to question

Digital topographic data and modern automation software are providing unique ways to view topography. This question addressed these unique view requirements as they relate to high resolution data.

Responses

This is a multi-response question.

Comments/Observations

One third (17) of the respondents desired wanted the full capability. In terms of total responses Terrain Masking and Terrain Profiling each had 41 responses, Hill and Relief Shading had 37 responses and Hypsometry has 19. It is apparent that these are useful features to a significant number of the questionnaire respondents.

Question Statement

III-20 Do you require displayable topology or attribute data concerning features (eg., bridge clearance and loading data, or road characteristic data)?

a. Yes
b. No
c. Don't know

Background to question

There are many potential ways to display DTD regardless of detail. The most basic is a map background that merely displays data without additional information, not unlike a map behind an acetate overlay. More sophisticated displays permit the identification of a particular feature in the display and automatically obtaining stored information about that feature. This is the condition this question addresses.

Responses

This is a yes/no/don't know question.

Comments/Observations

Eighty-one percent (42) of the respondents indicated they want this capability. Four percent (2) did not, and fifteen percent (8) were undecided.

Question Statement

III-21. Do you need queriable (smart data) attribute and topology data (eg. Display all bridges with load bearing capacity over 60 tons)?

a. Yes
b. No

Background to question

This question takes the previous question further. The next step in data display sophistication is the ability to query the data base for a set of feature or attribute criteria and have those entities satisfying the parameters displayed. In the question's example, this might be to determine an acceptable route for an armored vehicle that must traverse a number of bridges. Although this type of "smart data" system places the most demand on the data base and supporting automation capability, this is where the computer truly begins to serve the user in the decision-making process.

Responses

This was a yes/no question.

Comments/Observations

Eighty-seven percent (45) of the respondents indicated a need for "smart data" systems.

Question Statement

III-22. How do you want these attributes displayed?

a. Windowed into HIRUS display
b. Separate display terminal
c. Separate screen display that can be toggled on and off from spatial display
d. Don't know
e. Don't need attributes, just spatial data view
f. Other _____

Background to question

One issue with "smart data" type functionality is how it will be displayed to the user. This question poses some of the popular alternatives to displaying these data.

Responses

Most respondents provided a single response to this question. The following table displays the total responses in rank order.

HOW SHOULD ATTRIBUTES BE DISPLAYED
Ques III-22

52 RESPONDENTS

KEY	RESPONSE	#
A	WINDOWED	25
C	SEP SCREEN DISPLAY	15
D	DON'T KNOW	12
B	SEP TERMINAL	5
C	DON'T NEED DATA	2
F	OTHER	0

Table 17

Comments/Observations

The purpose of this question was to solicit a group of potential users as to their graphical user interface desires. Several respondents questioned why a data set query would include such questions. The reason they were included was to glean a sense of what the user population needs and is capable of using. If a data base needs to be molded to accommodate certain user desires or needs, it is far better to know this information at the beginning of the project than after a data set is already built.

Question Statement

III-23. Do your applications require other data formats (eg. imagery, ground photos, drawings and illustrations, video) linked to the spatial data so they could be displayed on demand?

a. Yes
b. No
c. Don't know

Background to question

This is rapidly becoming a multi-media world of automated products. As mentioned earlier, traditional storage methods of manual data have been using photos, drawings or illustrations. If these valuable sources of information are to be useful, they must be associated with their associated automated data sets.

Responses

This was a yes/no/don't know question.

Comments/Observations

Eighty-seven (45) percent of the respondents wanted a link between their spatial data bases and these hard copy data. Five respondents did not know and two indicated no need.

Question Statement

III-24. If III-23 is yes, what additional support data types would be desired? (please indicate multiple items if appropriate)

a. national imagery
b. tactical imagery
c. multispectral imagery
d. other national sources
e. civil Synthetic Aperture Radar (SAR) (eg., Russian ALMAZ)
f. ground photos
g. drawings, blueprints and illustrations
h. video
i. audio
j Other spectral data

Background to question

This question lists a number of data types that might be associated with a high definition data base. The purpose was to get a sense of what types of data should be linked.

Responses

The following table illustrates the findings by question order.

OTHER DATA TYPES LINKED TO HIRUS
Ques III-24

52 RESPONDENTS

KEY	RESPONSE	#
A	NATIONAL IMAGERY	37
B	TACTICAL IMAGERY	37
C	MULTI-SPECTRAL IMAGERY	39
D	OTHER NATIONAL SOURCES	27
E	CIVIL SAR	20
F	GROUND PHOTO	31
G	DRAWING, BLUEPRINTS, ETC	27
H	VIDEO	26
I	AUDIO	10
J	OTHER SPECTRAL DATA	12

Table 18

Comments/Observations

There appears to be an appreciation for multi-sourced data sets in view of the substantial responses to these data types. For example, aerospace imagery (national, tactical, MS,) ranked in the seventy percent range. One respondent indicated they wanted ALL Spectral Data,

Question Statement

III-25. Would you want the capability to overlay these data onto the HIRUS spatial data set?

a. Yes
b. No
c. Don't know

Background to question

This question most aptly applies to imagery data although it could have other applications.

Responses

This was a yes/no/don't know question.

Comments/Observations

Eight-one percent (42) of the respondents wanted a capability to overlay other data types on a high definition data set. Seven respondents did not know.

Question Statement

III-26. If, yes, what would be most useful for your applications? (multiple answers OK)

a. national or tactical imagery
b. multispectral imagery
c. other national sources
d. civil SAR
e. Digital Terrain Elevation Data (DTED)
f. Other _____

Background to question

This question was to ascertain which type of data is most useful for the applications of the users. This question as well as question III-24 above included civil Synthetic Aperture Radar. This source was included to ascertain the degree of interest there is in the SAR source, and particularly civilian SAR were it available.

Responses

Six of the data types in question III-24 were listed in the multi-response question. In addition to the items in question III-24, DTED was added. The following table illustrates the answers in question order.

OTHER DATA TYPES MOST USEFUL
Ques III-26

52 RESPONDENTS

KEY	RESPONSE	#
A	NATIONAL AND TACTICAL IMAGERY	32
B	MULTI-SPECTRAL IMAGERY	23
C	OTHER NATIONAL SOURCES	18
D	CIVIL SAR	10
E	DTED	29
F	OTHER	6

Table 19

Comments/Observations

As expected, imagery and DTED are considered the most useful, with MSI following in third position. Other responses included Map Background, Installation data (which is what HIRUS is about), Ground Photos, Interim Terrain Data (ITD), Tactical Terrain Data (TTD), and Operation Plan (Oplan) Overlays.

Question Statement

III-27. Do you require the capability to see an overlay of grids on the HIRUS display?

a. Yes
b. No
c. Don't know

Background to question

Often there is a need for orientation grids to be overlaid onto a product. Since most maps have integral grids, users are used to seeing them on a product. This question asks if these same grids are required for a high definition data set.

Responses

This was a yes/no/don't know question.

Comments/Observations

Eighty-one percent (42) indicated they desired the capability of displaying grids on a high definition product. Eight responded they did not know and two said no. One comment was to have a toggle on and off capability.

Question Statement

III-28. What grids would you want displayed and labeled?

a. Latitude and longitude
b. MGRS/UTM
c. Other _____

Background to question

This query lists the possible types of grids that might be displayed.

Responses

There could have been a "both" response on this multiple response question.

Comments/Observations

Forty-four responded that they wanted MGRS/UTM and thirty-eight indicated they wanted Latitude and Longitude. This is a good indication that both grid formats are necessary. "Other" generated additional grids types including GEOREF (a grid), WGS 84 (not a grid), "Many" (not sure what this means), and variable hex overlays. In addition, there were functionality requests for the toggle capability, and grid selectability by the operator.

Question Statement

III-29. Would you want the ability to use colors, fill patterns, line outline weights or display different types of information? (Fill patterns might be solid or transparent colors, hatch, cross hatch, dotted or double hatch)

a. Yes
b. No
c. Don't know

Background to question

This graphical user interface (GUI) question was to see if these techniques were acceptable as methods of illustrating features or attributes in the spatial display.

Responses

This was a yes/no/don't know question.

Comments/Observations

Eighty-five percent (44) answered to the affirmative, with one negative and five don't knows.

Question Statement

III-30. Would you want hard copy output of automated displays?

a. Yes
b. No
c. Don't know

Background to question

It is useful to use spatial data in the automated mode but often hard copy output is required. This question addressed the need for hard copy output.

Responses

This was a yes/no/don't know question.

Comments/Observations

Eighty-seven percent (45) indicated that hard copy output was required.

Question Statement

III-31. If you want hard copy, what type of output would your applications need? (Indicate multiple needs if appropriate)

a. Laser printer quality black and white output of spatial data
b. Color output (color laser printer) of spatial data
c. Large format output in either color or black and white
d. Text output of attribute and supporting textual data
e. Graphic output of support data
f. Image output of support data
g. Other _____

Background to question

This was the last question of the survey. It listed various types of data output that might be appropriate for a high definition data set.

Responses

This was a multi-response question. The following table indicates the responses in question order.

HARD COPY OUTPUT
Ques III-31

52 RESPONDENTS

KEY	RESPONSE	#
A	LASER PRINTER	26
B	COLOR OUTPUT	32
C	LGE FORMAT, B&W OR COLOR	26
D	TEXT, SUPPORT DATA	25
E	GRAPHIC, SUPPORT DATA	23
F	IMAGE, SUPPORT DATA	20

Table 20

Comments/Observations

There appears to be a wide variety of needs in the way of hard copy output is displayed with even responses as to the type of output desired. It also appears that all data, both the DTD and the other linked data must have a means of hard copy output.

PART III.

FINDINGS

The above findings of the fifty-two respondents to the HIRUS questionnaire validate the belief of the USATEC Digital Concepts and Analysis Center that there exists a need for high definition digital data. The findings also underscore the observations of the U. S. Army program managers who have indicated that these data are necessary for the success of their systems.

One of the striking points of the survey is *the broad range of applications and tasks* the respondents have indicated are conducive to the use of these data. *The modeling and simulation, and mission planning and rehearsal communities are clearly at the top as the primary users.* However, the spectrum through the operations, modeling and simulation, research, development and testing, training, intelligence and systems development activities is most enlightening. A review of Appendices Two and Three underscores the *broad areas associated with high resolution data* from the viewpoint of those who are working the problems.

Although there is a range of viewpoints, the consensus is that high definition information is just that - *highly detailed features accompanied with "smart data" attributes which can be queried in the process of problem solving.* The desire goes beyond map background information to truly *spatial information that can be linked with other types of data,* such as imagery, or text, to provide a wide spectrum of informational tools.

The *need to systematize feature data* in a more organized manner than traditional cartographic origins have provided appears to be important. The cartographic feature groupings used in the questionnaire did not satisfy users who regularly use *fused data sets derived from cartographic and non-cartographic origins.*

High resolution data includes information concerning features that extend above the ground/surface, that exist on the ground/surface, and are beneath the ground/surface. There was a great interest in towers and antenna for a variety of reasons. Ninty percent of the respondents wanted *functionally identified installation and facility data to include sub-facility identifications and attribution.* Ninety-six percent wanted *multiple levels of detail* varying from the

installation level to the interiors of buildings and objects therein. Underground features include features that are shallow, such as buried powerlines, or deep, such as mines. Their documentation has been neglected to date. However, they represent an important addition for some applications and tasks as indicated by this survey. These examples underscore the diversity of the need and the scope of high definition data required to satisfy the diverse potential users.

High resolution data sets are not just a mapping, charting and geodesy issue. They represent more than a detailed spatial portrayal of cultural and physical information. Much of the system organization, feature identification and attribution details will come from non-cartographic sources and organizations. This will require coordinated development, maintenance and management of such data sets particularly in view of the user's desires to update their data sets.

There are a number of critical system architecture, data standards, organizational roles and missions, security, and production issues that must be addressed to make high resolution data a reality. It is not the place of this report to investigate them. Some of the questionnaire respondents did raise them however. It is sufficient to say here that they are recognized as part of the challenge to make high resolution data a usable commodity.

RECOMMENDATIONS

Continue this effort to develop high resolution data sets. A wider Department of Defense data call should be conducted to ascertain the full extent of the need for these data.

Document the core issues critical to high resolution data sets which would affect their development, maintenance and use.

Initiate dialogue among the potential suppliers of these data to include at a minimum the cartographic/hydrographic organizations and the intelligence organizations.

Investigate the past creation and applications of high resolution digital data to ascertain the "lessons learned" concerning its creation, maintenance and use.

Identify the potential architectural system(s) that a HIRUS type data set might use, and assess their strengths and shortfalls.

Prepare and demonstrate a sample data set to document the data issues of high definition data and to further evaluate its potential to users.

Based upon the above findings, prepare a draft military specification that embodies the requirements, functionalities and data content necessary to address the diverse needs of DoD users.

APPENDICES

Appendix 1: List of Organizations Responding

U.S. Army Ballistic Research Laboratory
U.S. Army CECOM Signal Directorate
U.S. Army Natick RD&E Center
United States Central Command
U.S. Army Europe/7th Army Training Center
U.S. Army PM-CATS
U.S. Air Force Special Operations Command
U.S. Army PM-CTIS
U.S. Army Combined Arms Center/Ft Leavenworth
U.S. Joint Special Operations Command
U.S. Navy, COMMANDER NAVAL SPECIAL WARFARE (COMNAVSPECWAR)
Simulation Technology Inc, Contractor for Natick RD&E Center
U.S. Army Forces Command
U.S. Army Central/3rd Army
U.S. Army TACOM RD&E Center
U.S. Army Strategic Defense Command
U.S. Army Military Police School
United States Southern Command
U.S. Army 160 Special Operations Aviation Regt, ABN
U.S. Army Engineer School
U.S. Army Intelligence Center/Ft Huachuca
U.S. Army PM-ACTS
U.S. Army Engineer Cold Regions Laboratory
United States Special Operations Command
U.S. Army Construction Engineering Research Laboratory
U.S. Army STRICOM (PM-TRADE)
U.S. Army Security Operations Training Facility
U.S. Army Waterways Experiment Station
U.S. Army Special Operations Command
U.S. Army 1203 Engineer Battalion
U.S. Army PM-PATRIOT
U.S. Army JFK Special Warfare Center & School
U.S. Army PM-ITTS
U.S. Army Topographic Engineering Center

Lawrence Livermore National Laboratory
U.S. Army Pacific
Joint Warfare Center
U.S. Army PM-ASAS
U.S. Army PM-ABRAMS

The FAAD Sensors Product Office response was received too late to be incorporated into the report.

- Virtual Reality
- Match with 10 digit MGRS coordinates
- Dismounted infantry to use folds in the ground for cover and concealment
- ARTBASS/JANUS/TACSIM/CSSTSS/WARSIM 2000
- Map Accuracy for 1:50,000
- Targeting Info - Air Defense Weapons Limitations
- ATSS Required Operational Capability
- Black out night low level aircraft ops
- 3 dimensional planning and rehearsal
- Land rehabilitation engineering projects
- Operation of Close Air Support for 'danger close' applications
- PSYOP & Civil Affairs Automated Data System (POAS)
- Mission Planning
- ALBE GIS
- Relative accuracy between 2 points is of vital importance
- FORSCOM Automated Intelligence Support System
- ASAS training parameters
- Multi-discipline Counterintelligence Analysis
- DTSS, Support of Airland Operations, Topographic Engineer Master Plan
- Weapon pinpoint targeting and target (fixed) location for ingress route planning - night conditions using GPS aids in navigation
- Search/sweep counterdrug/LIC ops
- Facility size & outline complexity
- Would like the ability to detect collisions down to "tank size" features
- Precision long range munitions
- Geographic Information System applications development in support of counter drugs and key asset protection
- TACJAM-A, Advanced QUICKFIX, Groundbased common sensor, ASAS
- Locate bridge relative to road, etc.
- Intelligence Preparation of the Battlefield/Operational Area
- DTSS
- Employment of multiple fire support assets (based on geodetic coord system) in a danger close environment

- Radar location & height placement in relation to control van [PATRIOT] for missile acquisition. Distance may be up to 40kms. Radar is sensitive to horizontal distances <50m at all ranges
- We have global positioning system (GPS) P-code instrumentation which gives down to 3 meter resolution (RMS). We must plot this accurately for test officers to assure themselves the attacker could hit the target
- Aviation, weapons, target acquisition, terrain analysis, counter-terrorism
- Close combat tactical trainer
- Accurate representation of urban features
- Exercise training support to warfighting CINCs

- Replicate real world
- Requirement to calibrate/validate simulation results with actual field exercise results
- ARTBASS/JANUS/TACSIM/CSSTSS/WARSIM 2000
- 1:50K Accuracy - 1 contour interval
- Air Defense weapons systems/tank gunnery
- ATSS ROC
- Blacked out night low level aircraft ops
- 3 dimensional planning & rehearsal
- Operational requirements to service military installations
- Operation of close air support for "danger close" application
- Line of Sight transmission capability (FM microwave)
- Mission Planning
- ALBE GIS
- Relative accuracy between two points is of vital importance
- ASAS training parameters
- Multi-discipline Counter Intelligence Analysis
- DTSS, Support of Airland Operations, Topographic Engineer Master Plan
- Low level flight & weapon targeting; Operational/development: Forward Terrain Following Radar
- Line of Sight
- Terrain modeling using DEMs
- TACJAM-A, Advanced QUICKFIX, Ground bases Common Sensor, ASAS
- Locate building on terrain (vice-floating, etc)
- Intelligence Preparation of the Battlefield/Operational Area
- DTSS
- Employment of multiple fire support assets (based on geodetic coord system) in a danger close environment; most systems are airborne systems
- Urban terrain visualization; system emplacement in urban terrain; launch emplacement in relation to radar; 3D volumes for intercept
- Operational testing to satisfy congressional direction
- Aviation, weapons, target acquisition, terrain analysis, counter-terrorism
- Realistic rendering of terrain & models
- Close Combat Tactical Trainer
- Accurate representation of urban features

- Realistic training requirements for the CINCs staff elements